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EVALUATING DEVELOPMENT IMPACT

case study
chelmsford, massachusetts

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EVALUATING DEVELOPMENT IMPACT

with Case Study for

TOWN OF CHELMSFORD, MASSACHUSETTS

Massachusetts Department of Community Affairs

Local Assistance Series

Publication No. 3

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PREFACE

This report is part of a special series of local assistance studies undertaken by the Community Planning and Management Section, Office of Local Assistance, of the Massachusetts Department of Community Affairs, financed in part through the Federal HUD 701 Planning and Management Assistance Program. This series of studies represents a departure from previous efforts of the Department in providing technical assistance to Massachusetts communities under 50,000 population. Earlier efforts of the DCA concentrated limited staff and consultant resources to produce long-term (1 to 2 year) master plan studies for only a few of the Commonwealth's cities and towns each year. In contrast to this former approach, DCA's delivery of technical assistance now concentrates short-term efforts on addressing urgent local issues of state-wide significance, through the use of the case study or model approach.

A key element in this style of technical service delivery is that DCA staff and consultants attempt to achieve solutions which might help many communities by gaining concrete and practical insights into a problem in the context of a given community. In this way, other communities facing similar problems can benefit from the work performed in the model community.

This study concentrates on the problem of evaluating development impact, and the model community was the town of Chelmsford. Other studies conducted as part of this new service and the communities in which they were carried out are as follows: Establishing a Department of Community Development, Peabody; Preserving Agricultural Land, Westfield; Developing a Land Use Management Process, Mashpee; Organizing for Economic Development, Wareham; Monitoring Change in Residential Neighborhoods, Melrose; Revitalizing Small Town CBDs, Millbury; and Evaluating Reuse Options for Large Institutional Land Holdings, Lenox. These projects were selected by DCA from among 70 applications by over 50 municipalities under 50,000 population from across the state.

The Planning and Management Section of the Office of Local Assistance wishes to acknowledge the contribution of the many local officials and citizens who were involved in these studies. Without their interest, cooperation, and critique, these studies would not be as meaningful to you.

We urge you to contact the Office of Local Assistance for further information if your community is considering action in the area covered in this report. Let us know too if you find these studies useful or have any suggestions in improving DCA's new program of technical assistance.

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
Chapter 1. PROCESS OF IMPACT ANALYSIS	3
Chapter 1A. IMPACT SUMMARY: DRUM HILL REZONING	22
Chapter 2. TRAFFIC IMPACTS	35
Chapter 2A. TRAFFIC IMPACTS OF DRUM HILL REZONING	54
Chapter 3. FISCAL IMPACTS	65
Chapter 3A. FISCAL IMPACTS OF DRUM HILL REZONING	88
Chapter 4. PUBLIC FACILITY IMPACTS	96
Chapter 4A. PUBLIC FACILITY IMPACTS OF DRUM HILL REZONING	109
Chapter 5. ECONOMIC IMPACTS	112
Chapter 5A. ECONOMIC IMPACTS OF DRUM HILL REZONING	128
Chapter 6. SOCIAL IMPACTS	137
Chapter 6A. SOCIAL IMPACTS OF DRUM HILL REZONING	153
SELECTED BIBLIOGRAPHY	154

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1-1 (SAMPLE) IMPACT CHECKLIST	8
1A-1 POTENTIAL DEVELOPMENT	23
1A-2 TAX RATE CHANGE	25
1A-3 EMPLOYMENT IMPACTS	27
1A-4 CONSEQUENCES OF REZONING	30
2-1 AVERAGE DAILY TRAFFIC BY LAND USE	37
2-2 COMMON TRAFFIC VOLUMES	41
2-3 SUGGESTED SIGHT DISTANCES FROM DRIVEWAY	44
2-4 EVENING RUSH HOUR TRAFFIC	46
2-5 UNUSUAL PEAK TRAFFIC TIMING	46
2-6 LEVELS OF SERVICE	48
2-7 MAJOR TRAFFIC GENERATORS	51
2A-1 AVERAGE DAILY TRAFFIC FROM DEVELOPMENT AT DRUM HILL	57
2A-2 GENERAL TRAFFIC DISTRIBUTION FOR SHOPPING CENTER ...	58
2A-3 INCREASE IN DAILY TRAFFIC AT CRITICAL LOCATIONS	59
2A-4 POSSIBLE FUTURE CONGESTION AT CRITICAL LOCATIONS ...	60
2A-5 TRAFFIC INCREASES AT HAZARDOUS LOCATIONS	62
2A-6 TRUCK TRIPS	64
3-1 NUMBER OF PUPILS PER UNIT: IMPORTANT FACTORS	72
3-2 TYPICAL NUMBER OF PUPILS PER NEW DWELLING UNIT	73
3-3 NUMBER OF PUPILS PER UNIT, BY BEDROOMS	73
3-4 SCHOOL AID CHANGE	80
3-5 SAMPLE FORMAT: TAX RATE CHANGE DUE TO DEVELOPMENT ..	84
3A-1 ESTIMATED TAX RATE CHANGE	89
3A-2 REVENUES	90
3A-3 NON-SCHOOL COSTS	91
3A-4 STATE SCHOOL AID LOSS	92
3A-5 TAX RATE CHANGE, IF FULL DEVELOPMENT	95
4-1 LIKELIHOOD OF PUBLIC WATER SYSTEM	100
4-2 LIKELIHOOD OF PUBLIC SEWERAGE	104
4-3 JUSTIFICATION FOR SOLID WASTE COLLECTION	106
4-4 SOLID WASTE GENERATED BY BUSINESSES	107
4-5 PROXIMITY OF FIRE STATIONS	108
5-1 EST. CONSTRUCTION JOBS BY BUILDING TYPE	115
5-2 SQUARE FEET PER EMPLOYEE	116
5-3 AVERAGE ANNUAL WAGES IN MASSACHUSETTS, 1974	119
5-4 OCCUPATIONS FOR DIFFERENT INDUSTRIES	121

LIST OF TABLES (cont.)

<u>Table</u>	<u>Page</u>
5A-1 ESTIMATED PERMANENT JOBS	129
5A-2 CONSTRUCTION JOBS: MAN-YEARS LABOR ON-SITE	130
5A-3 PERMANENT JOBS IF SITE DEVELOPED	131
5A-4 POSSIBLE JOB CHARACTERISTICS	132
5A-5 OCCUPATIONS	133
5A-6 EFFECT OF SHOPPING CENTER ON CHELMSFORD STORES	135
6-1 PERSONS PER NEW UNIT	141
6-2 POPULATION CHARACTERISTICS, NEW AND OLD DWELLINGS (BOSTON SMSA BUT NOT IN BOSTON CITY, 1970)	147
6-3 GOVERNMENT STRUCTURE, 1975	150

LIST OF FIGURES

<u>Figure</u>	<u>Following Page</u>
1 PROPOSED ZONING AND PROPOSED SHOPPING CENTER	22
2 SAMPLE TRIP DISTRIBUTION FOR A RESIDENTIAL DEVELOPMENT	39
3 LEVELS OF SERVICE	48
4 SHOPPING CENTER TRAFFIC DISTRIBUTION	58
5 CRITICAL LOCATIONS	59
6 SHOPPING CENTER EGRESSES	62

INTRODUCTION

This book is intended as a practical guide for local governments analyzing impacts of major development proposals. It provides a general approach to impact analysis, suggests methods, points out key issues, and provides background information.

This guidebook was prepared with the financial support of the U.S. Department of Housing and Urban Development, the Office of Local Assistance of the Massachusetts Department of Community Affairs, and the Chelmsford Planning Board. D.C.A. and the Planning Board determined the nature and scope of the effort and provided advice, criticism and technical assistance.

The subject is vast. This guidebook can only deal with some of the important issues. It focuses on:

1. Massachusetts, with methods appropriate for the state's fiscal system, zoning and land use controls; Massachusetts sources are used where available.
2. Small communities, with less than 50,000 people.
3. Specific development proposals, for particular sites, not long-range comprehensive plans for the whole community.
4. External impacts of the development on the rest of the community, rather than internal issues such as traffic circulation within the site.
5. Local impacts of the development, not effects on the region or state; the regional planning agency, Office of State Planning, and D.C.A. can help evaluate broader impacts of development.
6. Fiscal, traffic, public facility, economic and social impacts, not impacts on the natural environment, hard-to-predict social/psychological effects (sociability, crime), compliance with local plans, or changes in government operations (police patrol patterns, snow plow routes, etc.) except where they affect the tax rate or require new facilities.
7. Methods for use by local officials and citizens to identify major impacts of a proposal, rather than more elaborate and technical approaches; professional analysis is suggested where appropriate.
8. Local procedures and regulations to provide a framework for impact analyses.

How to Use This Book

This guidebook covers a wide range of issues and possible situations. It is designed more for reference than for reading cover to cover. Organization is as follows.

a. The first chapter describes an overall approach to prepare for, conduct, and interpret findings of impact studies.

b. "How to do it" chapters deal with particular issues: e.g., fiscal impacts, traffic impacts. Only some of the sections will be relevant for any particular proposal.

c. Each of these methods is illustrated by applying it to a commercial rezoning proposal at Drum Hill in Chelmsford.

CHAPTER 1

PROCESS OF IMPACT ANALYSIS

Communities are often confronted with major development proposals whose effects are large, mixed, unclear, perhaps hotly disputed. A careful and systematic consideration of the consequences of the proposal will help to:

1. Inform local discussion and understanding of the proposal;
2. Bring issues out into the open and deal with them explicitly;
3. Suggest ways of changing the proposal so that it becomes more responsive to local needs;
4. Inform and help justify the public decision, e.g., a zoning amendment, special permit, variance, subdivision plan approval or urban renewal project*;
5. Plan for accommodating the new development by identifying public facilities that may need to be built or extended; and
6. Identify local issues which go beyond the particular development proposal, suggesting an agenda for community action (e.g., revising zoning requirements, studying certain public facilities in more depth); analysis of a specific and perhaps controversial major development can provide the concreteness and sense of urgency that suggestions in general planning documents such as a Master Plan sometimes lack.

Impact analysis should not be used, however, to delay a proposal to death. Where imposed simply as an extra "hurdle", analysis is unfair to the developer, legally questionable, and often wastes the developer's and community's time, money and energy**.

Impact analysis can be most effective when treated as an integral part of the community decision-making process. Timing, contents and method of preparation should all be keyed to that process. Following is a step-by-step discussion of how a community might use impact analysis to aid local decisions***.

*Analysis may also be helpful for local input into a state or federal decision such as the State Housing Appeal Committee's decision on a Ch. 774 low and moderate-income housing project.

**Extra delays can be avoided in some cases by conducting impact studies as part of special permit or site plan review procedures or at the same time as (and input into) a federally or state-imposed environmental assessment procedure.

***A valuable book on this subject is Philip Schaenman, and Thomas Muller, Measuring Impacts of Land Development, Washington, D.C.: Urban Institute, 1974.

STEP 1. PREPARE FOR MAJOR DEVELOPMENT PROPOSALS

The following actions can be taken before the community is faced with a major proposal (not all are relevant or needed in any one community).

1.1 Amend Regulations to Control Impacts

Many potential development impacts are ordinarily controlled by standards in the zoning bylaw and subdivision regulations, such as those dealing with off-street parking, noise and vibration levels, number of units in each multi-family structure, drainage and erosion. Parking impacts, for example, can be confined to the site by adequate off-street parking requirements. Wherever clear and generally applicable standards are possible, they provide the simplest and most efficient way to control impacts.

1.2 Amend Regulations to Allow Discretionary Decisions

It is often appropriate to require a Special Permit or other discretionary review and approval for major developments (rather than allow them outright). The Special Permit process enables officials to analyze a specific development proposal, obtain detailed information from the developer, learn the views of interested parties through a public hearing, attach conditions (as suggested by the analysis) and make a discretionary decision.

Special Permits are appropriately required for developments likely to have significant effects on the community. These effects may be related to the size of the development (more than so many dwelling units or square feet), its traffic flow *, its use (e.g., an explosives factory, whatever its size), or its geographic location (wetlands, steep slopes, etc.).

1.3 Amend Regulations to Require Impact Data

Site plan review, Special Permit, and subdivision submission requirements can require the developer to detail major development and to conduct at least some of the analyses**.

Such submission requirements should make clear in advance exactly what information and analyses are required. The scope of that information and analysis should be reasonably related to the scale of the proposal.

*Major traffic generators which might be subject to Special Permit are listed in the Traffic Impacts chapter.

**Special Permit requirements for traffic data are illustrated on page 53.

1.4 Amend Regulations to Link Approvals to Impacts

Impact criteria can be specified in local zoning as the basis for Special Permit approval*. These criteria provide an obvious focus for the analysis**. Ways of relating criteria to permit approval include:

a. Individual guidelines, each of which should be satisfied, such as, "Shopping centers should be so located that traffic is not increased 50% or more above current average daily traffic volumes..." and "vehicles egressing from shopping centers shall have at least 400 feet visibility in each travel direction", etc.; or

b. Impacts which must be balanced in the decision; for example:

"Special permits shall be granted by the Board of Appeals only upon its written determination that the proposed use will not have adverse effects which overbalance its beneficial effects on either the neighborhood or the town, in view of the particular characteristics of the site and of the proposal in relation to that site. The determination shall indicate consideration of each of the following:

- a) Social, economic, or community needs which are served by the development;
- b) Traffic flow and safety;
- c) Adequacy of utilities and other public services;
- d) Neighborhood character and social structure;
- e) Qualities of the natural environment;
- f) Potential fiscal impact."

1.5 Pre-Arrange for Technical Assistance

Major development proposals occur on an irregular basis. It is valuable for the community to have an on-going arrangement to provide capabilities for conducting such analyses. This can avoid last-minute scrambling and enable the experience of each impact analysis to simplify the next.

*The new state zoning law also provides that impact criteria shall be the basis for allocating density bonuses in cluster developments (Ch. 808, Acts of 1975).

**Possible criteria for phasing residential development are shown on page 144.

The analyst's role is to structure study efforts, conduct specific studies, obtain and review data from other public agencies and the developer, summarize findings in charts or writing, and report back to and work with the agency responsible for the analysis.

Larger communities generally assign planning department staff to this task. Some small communities retain an outside professional for these contingencies as well as for other technical assistance. A regional planning agency can provide similar services for its member communities.

A non-professional may also serve as the analyst. Such non-professional might be a Planning Board member, C.E.T.A. employee, other municipal official or employee, or private citizen who is interested in the subject, willing to invest time and energy, willing to tackle a wide range of issues and deal with numbers, and who is widely regarded as unbiased.

1.6 Build Local Data Base

It is valuable for a community to have an extensive, well-organized data base before development proposals are made. Analysis can then be conducted quickly and efficiently.

Impact analysis relies heavily on such data as tax rates, levies and assessments; school enrollments; traffic volumes and accident records; water consumption and capacity; building permits; capital improvement plans; housing and population data; studies of existing developments in the community. Where such data does not exist or is hard to obtain, impact analyses become time-consuming or superficial.

This data base can be assembled and expanded by major all-at-once efforts such as Master Plans and/or by regularly keeping and updating such information (perhaps a function of a local person who conducts impact analyses).

1.7 Define Community Objectives, Prepare Impact Checklist

Development should be evaluated in terms of local needs and objectives. It is important to spell these objectives out in advance in order that proposals can be initially designed to reflect local concerns, and in order to give better assurance of fairness and consistency in decisions. Local objectives can be documented in a variety of ways, such as by formulating:

- a formal community growth policy or Master Plan;
- local response to the 1976 State Growth Policy Questionnaire;
- specific criteria for the public decision (Special Permit, site plan review);

- a checklist to review development proposals; a sample checklist is shown on page 8, but should be adjusted to reflect local concerns.

STEP 2. SCREEN PROPOSALS

Development proposals are presented to a public agency, which must then decide how to review each. Some deserve detailed study. Others, usually the vast majority, do not. The following approach can be used to sort out proposals and determine an appropriate review process for each.

2.1 Informal Review by Agency

Officials can quickly screen all proposals, selecting out for further review those proposals which seem important or of uncertain merit or controversial.

2.2 Formal Review by Agency, Using Checklist

Those selected proposals can then be screened more formally with a comprehensive checklist (such as the one on page 8). Look for potentially significant impacts and guess whether each will be good or bad (value judgments are built into some items: job opportunities presumably are good, traffic hazards bad).

Proposals can then be sorted into two groups:

a. Those not needing further study because their significant impacts are easy to predict, or are almost all good or all bad, or are very limited in number; for such proposals, the filled-in checklist may itself be a useful aid in the public decision.

b. Those needing further analysis to clarify critical impacts or the balance among them.

2.3 Decide Scope of Citizen Participation (If Any)

The public agency should decide how to engage citizen participation in the impact analysis process. It is often valuable to hear from local residents early in the analysis process. They can help identify the issues that deserve the most attention before large amounts of time and energy are invested. Too often, the final public hearing reveals that the issues studied in the most detail were not the ones people were really concerned about.

Participation can be relatively brief or extensive.

a. Informal Hearings. An informal public meeting could be scheduled to hear from neighbors of the proposed development and others who are interested. After the studies are conducted, preliminary findings should be presented to another public meeting, to allow input into the final conclusions.

Table 1-1
(SAMPLE) IMPACT CHECKLIST

Impact on	Impact likely to be			Deserves further study by	For method see page
	Not Significant	Significant	Don't Know		
<u>Traffic</u>					
Congestion at peak hour	—	—	—	—	45
Safety hazards	—	—	—	—	43
Quality of life on nearby streets	—	—	—	—	50
<u>Municipal Finances</u>					
Local tax rate	—	—	—	—	68
Bonded indebtedness	—	—	—	—	83
<u>Public Facilities</u>					
Need for major school additions or construction	—	—	—	—	97
Need for major improvements in public water system	—	—	—	—	99
Need for major improvements in public sewer system	—	—	—	—	103
Need for major improvements in public recreation facilities	—	—	—	—	98
Need for major improvements in other public facilities. Specify:	—	—	—	—	105-108
_____	—	—	—	—	
_____	—	—	—	—	
_____	—	—	—	—	

Table 1-1 (cont.)

Impact On	Impact likely to be				Deserves further study by	For method see page
	Not Significant	Good	Bad	Significant		
<u>Economy</u>						
Increase in job opportunities	—	—	—	—	—	114
Type of job opportunities	—	—	—	—	—	118
Sales level of existing businesses	—	—	—	—	—	118
Entrepreneurial opportunities	—	—	—	—	—	123
Diversity of the local economy, other long-term effects	—	—	—	—	—	123
Nearby property values	—	—	—	—	—	124
<u>Social Character</u>						
Community population, total and growth rate	—	—	—	—	—	139
Local housing supply, range of choice, especially for low and moderate income residents	—	—	—	—	—	146
Local government structure, style	—	—	—	—	—	149
Community amenities, e.g., range of shops, facilities; historic sites	—	—	—	—	—	151
Visual character of area	—	—	—	—	—	152
Image of community held by residents and outsiders	—	—	—	—	—	152

Table 1-1 (cont.)

Impact on	Impact likely to be				Deserves further study by	For method see page
	Not Significant	Good	Bad	Don't Know		
<u>Community Growth and Planning</u>						
Departure from Master Plan or community growth policy	—	—	—	—	—	a
Site valuable for (or well-suited to) other kinds of development	—	—	—	—	—	a
Precedents for future public decisions	—	—	—	—	—	a
Spatial pattern of growth in the community	—	—	—	—	—	a
Stimulus to further development	—	—	—	—	—	a
<u>Natural Environment</u>						
Level of air pollutants	—	—	—	—	—	a, b
Groundwater and surface water quality (e.g., "highest safe use")	—	—	—	—	—	a, b
Noise and vibration level in vicinity	—	—	—	—	—	a, b
Erosion on and off-site	—	—	—	—	—	a, b
Risk and damage of natural disaster (e.g., by building on a flood plain)	—	—	—	—	—	a, b
Ecological stability of fragile areas (such as dunes and wetlands)	—	—	—	—	—	a, b
Groundwater level	—	—	—	—	—	a, b
Wildlife habitats	—	—	—	—	—	a, b
Natural vegetation, especially unusual species and mature trees	—	—	—	—	—	a, b

^aNot dealt with in this guidebook.^bSee bibliography for some sources.

b. Citizen Panels to Guide Studies. More extensive participation may be valuable where the development is very large and controversial. An underlying issue in such cases is often public distrust of the developer and, sometimes, of local officials. An ordinary technical analysis prepared by a small set of public officials (whether or not helped by outside technicians) is then likely to be seen as biased or only marginally relevant to the controversy.

Citizen panels can be established to guide the studies, providing input and review at each stage in the analysis. Such a process can help build public understanding and trust. The resulting analysis is likely to be much more sensitive to local concerns, focused on critical issues, and respected in the community than one prepared by technicians without such involvement.

Structuring and carrying out such a participatory program requires time (probably 2 to 3 months), careful design, and substantial technical input. Organization has to be arranged so that results are not biased (or viewed as being biased) by self-selection of participants. Participants need an adequate opportunity to develop understanding of the proposal being considered. They need an opportunity for dialogue, preferably first with people having similar interests, later with people having divergent ones. Their process should be documented at each step of the way. Finally, all this needs to be made engaging and rewarding, or all but the most committed (biased?) will drop out.

STEP 3. FRAME ISSUES

The next step is to clearly structure the study effort. This involves:

- defining the proposal;
- defining the alternative(s);
- choosing the issues that deserve detailed attention;
- choosing who will give them that attention.

3.1 Define What is to be Analyzed

In most cases, it is not a specific development, but rather the probable consequences of a public decision which should be analyzed. The decision may be to approve a specific development plan (such as submitted for a Special Permit) or rezoning of a parcel, or rezoning of a larger area. It is the consequence of that decision which is to be analyzed. In most cases, that isn't the same as analyzing what the developer may describe as his intended development, since:

a. The developer may not actually be able to carry out his intent because of unforeseen market, financing, or other contingencies.

b. The developer may not even intend carrying out the proposal he illustrates. Rezoning almost never carries a commitment to a specific scheme, and even Special Permits often allow a wide range of alternatives under them.

c. Some part of what is proposed might not depend upon the present decision, perhaps because that part already has all necessary approvals, or is located in another jurisdiction.

Accordingly, it is necessary to carefully define exactly what is to be analyzed. In some cases, it will be the developer's proposal or some modification of it. In other cases, it will be the best or worst expectable outcome possible under the requested approval. Potential development should at least be defined as to type of land use, intensity of use (number of dwelling units or square feet) and location of egresses.

3.2 Define Alternative(s)

In the same way, consider what will happen if the proposal is rejected. The following development consequences may be important:

a. what is likely to be built on the site otherwise (e.g., under current zoning);

b. the possibility that turning down the proposal will simply shift the development to another site in the community or region (where effects on your community may be the same, better, or worse)*.

Where relevant, such alternative(s) should be roughly spelled out (in the same way as described for the proposal).

3.3 Choose Issues that Deserve Detailed Attention

Not all issues can or should be studied in detail. Study effort should focus on those issues where analysis would be most helpful, including those which meet all the following:

a. relevant to the public decision; for example, fiscal impacts are appropriately considered when rezoning, not when reviewing a subdivision plan;

b. can and need to be clarified by technical analysis; some impacts may already be clear, others so elusive that potential analysis would not be very useful;

*Economic consequences of shifting development are briefly discussed on page 112.

c. of particular local concern; e.g., water and school impacts where those are major local problems; and

d. are likely to be significantly affected by the development proposal (significant impacts may already have been quickly identified when going through the checklist to screen the proposal).

NOTE: don't ignore issues for which methods have not been described in this guidebook (e.g., impacts on the environment*, on community growth and planning*, and on the region and state).

Sources for identifying significant impacts include:

- Residents' concerns emerging from participatory efforts;
- Local experience of similar developments including the concerns they raised and their actual impacts;
- The discussion in this guidebook of key development attributes which affect each type of impact;
- Analogy with the experience of other communities which have had a similar development; if a 1 million square foot shopping center is proposed, it might be revealing to contact Burlington, for example, to find out what unanticipated impacts occurred there.

Issues should be framed as specifically as possible, in order to focus study effort. For example, the sample checklist breaks "traffic" down into more specific issues of peak hour congestion, safety hazards, and street character. Especially where there is controversy, it is useful to agree on what issues are being debated.

3.4 Choose Who Will Study Each Issue

Indicate who will study each issue, in order to allocate budget and responsibilities and to get the effort underway.

Studies may be provided and paid for by the community, by the developer, or by both together. It is generally valuable for a single person (or organization) to be in charge of the overall effort, but particular issues may be assigned to a public agency (e.g., school department, conservation commission), the developer's architects and engineers, or other specialists.

STEP 4. ANALYZE ISSUES

4.1 Key Questions

Analysis should address the following questions:

- a. What are the outcomes if the proposal is accepted, and what are they if it is rejected?

*See sample checklist for some specific impact measures.

b. What are the timing and likelihood of outcomes for each option? It is important to people (as well as to budgets and public facility plans) whether impacts are expected in 5 years or in 20 years*.

c. Who will be most affected? Elderly may benefit differently from teen-agers, workers from businessmen. Many proposals are economically and fiscally good for the community as a whole, but impose traffic and aesthetic burdens on the surrounding neighborhood. Effects on different groups in the community should be distinguished.

d. What changes in the proposal would make its impacts better? Identifying critical aspects of the development (e.g., phasing schedule, entrance location, mix of units) is often the most valuable part of the study. It enables the government to (1) negotiate with the developer for design modifications, (2) insist on guarantees that the good features of the proposal actually get built, and (3) set conditions and qualifications when approving the proposal.

4.2 Methods

The level of detail appropriate for analysis will vary from one issue to another, depending on its importance, the available data, and the skills of the analyst. Very extensive or precise analysis is not usually needed since the aim is simply to clarify the public decision. It should be kept in mind that the precision of the analysis is often limited by unreducible uncertainty of a key element, making great precision in other parts of the analysis irrelevant.

Specific study methods are outlined in later chapters. In general, studies should be based on:

- quantification where reasonable; approximate numbers and rough estimates are often all that is needed or useful;
- thinking through other qualitative impacts; issues should not be ignored because they are hard to quantify.

*For those comfortable with them, there are more sophisticated quantitative approaches for dealing with uncertainty and timing of consequences, such as decision theory and present value analysis. See, for example, Howard Raiffa, Decision Analysis, Introductory Lectures on Choices Under Uncertainty, Reading, MA: Addison-Wesley, 1968; James Van Horne, Financial Management and Policy, Prentice-Hall, 1974. Such non-intuitive approaches may, however, discourage many citizens from trying to understand the analysis.

STEP 5. INTEGRATE FINDINGS

Results of all the studies should be integrated and reported, through meetings, charts, text. Often, a brief summary report is prepared for wide distribution, along with a technical appendix detailing all studies. Whatever means are used, the aim is to make consequences of the public decision as clear as possible. The following aspects are involved.

5.1 Compare Alternatives

The outcome of approving and of rejecting the proposal should be contrasted. A summary table or chart can bring together all consequences for easy reference. Some possible formats are shown on the next page.

In comparing impacts, it is generally useful to:

- a. indicate all significant impacts (including obvious ones), not just those studied in detail;
- b. where impacts are still unclear or unknown, that too should be indicated (in table format, a simple "?" is quite eloquent);
- c. show how large each impact would be (in table format, simple orders of magnitude are often best; the bottom example shows large effects in capital letters so they stand out);
- d. indicate how good or bad each impact would be (or to what extent the proposal is better or worse than the alternative); where value judgments are involved, the amount of change can be described;
- e. where appropriate, note who would be affected by the impact;
- f. where appropriate, suggest the relative likelihood of the impact occurring under each option (for example, one might show the impact expected in the next 5 years if the proposal is approved and if it is rejected).

5.2 Indicate Uncertainties

The uncertainty of the predictions should be clearly stated. Impact analyses rely on past studies of other developments, assumptions about future change in the community, and often crude methods for allocating impacts among types of development. These uncertainties can at least be reflected by rounding off estimates, putting numbers in a range from low to high, or stating the results qualitatively. This may help prevent the analyst and the community from blindly trusting results simply because they are shown to the last decimal place.

SAMPLE IMPACT SUMMARIES

IMPACT OF FULL DEVELOPMENT*

	Present Zoning	Proposed Zoning
Development type	100% single-family	40% to 50% multi-family
New school children	1,650	1,550
Traffic impacts	bad	worse
Tax rate reduction	\$5.20	\$6.60
Social characteristics	little change	some change
South Natick visual character	substantial change	less change
Air quality	some change	more change
Water consumption	increase	less increase
Storm water runoff	increase	less increase
Sanitary sewerage	on lot	neighborhood system

IMPACT OF MULTI-FAMILY DEVELOPMENT ON EASTERN POINT ROAD COMPARED WITH:**

Type of Impact	Multi-family elsewhere	Single-family here
Schools	Better	Better
Sewerage	Better	Worse
Water	Better	Worse
Drainage	Better	Similar
Traffic	WORSE	Worse
Taxes	Better	Better
Visual	Similar	Worse
Ecology	?	Worse
Housing Needs	Worse	Better
Social	BETTER	Similar

*Herr Associates, "Planning for South Natick", prepared for Natick Homeowners Association and Martin Cerel, revised April 16, 1975.

**Large impacts shown in all capitals. Herr Associates, "Eastern Point Road Development", for Gloucester Planning Board, April 11, 1973.

More fundamental uncertainties should also be stated. Findings may be very sensitive to certain assumptions, such as those about:

- the probability of development;
- what form development will take; later changes in a preliminary scheme might make impacts much better or worse;
- the expected demand of new development, e.g., water use, number of school children, amount of traffic (general standards may not fit the particular development for one reason or another);
- the state's fiscal system, since changes might reduce local fiscal consequences of development.

Indicate where another still reasonable assumption would give very different results.

5.3 Suggest Actions to Improve Impacts

Such actions might include:

- ways for the developer to modify his plan;
- conditions for public approval of the proposal;
- changes in municipal regulations (e.g., require Special Permit for uses now allowed as of right);
- new public improvements that would be needed to accommodate the development.

Where an impact is still unclear and critical to the public decision, a more thorough investigation may be recommended. Such study goes beyond the general methods described in this guidebook, and usually requires specialized professional assistance.

5.4 Highlight Key Choices

Overall findings can often be distilled into a few key choices and trade-offs. Look for the following.

a. On what issues would the proposal make a significant difference? Other issues (sometimes the majority) can be safely ignored.

b. Are all the proposal's significant impacts better (or worse) than if the proposal were rejected? If so, the public decision is easy.

c. Does the proposal have a very severe negative impact so catastrophic it outweighs all benefits? Is that impact correctable? Again, the public decision may be clear.

d. Where the proposal has one major benefit and one major drawback, simply ask if the benefit is worth the cost. For example, is a \$2.00 reduction on the tax rate worth a 50% traffic increase on Main Street?

e. Are the overall effects on all groups in the community positive (or negative)?

f. Can the proposal be changed so that it would become clearly positive?

g. Finally, are there major uncertainties which might affect the public decision? Would one make the same decision under each assumption regarding the uncertainty?

STEP 6. USE FINDINGS IN PUBLIC DECISION

Many impact studies stop here. By disclosing impacts and highlighting key choices, the study provides a valuable aid for officials and citizens who will weigh the costs and benefits, then decide on the proposal.

It is possible for the study effort to go further, giving weight to each of the impact outcomes, summing over them, then making a final recommendation on the proposal. We are generally wary, however, of reliance on expert conclusions or a quantitative decision formula. Such methods are often tempting because they suggest an "objective" solution. Yet balancing advantages and disadvantages is a matter of judgment and values. Each person will weigh impacts differently, depending on how he is affected by the proposal, his preferences, and the importance he attaches to each issue. In our view, impact studies should help clarify these judgments, not make them.

A valuable final step, however, might be to involve a broad spectrum of residents in reviewing study findings. Citizen panels, for example, which earlier helped shape studies should review the results. Panels might jointly make a recommendation on the proposal, by consensus among the groups or by voting. More simply, open meetings can be held on preliminary findings. Such participatory approaches can provide useful input into the public decision.

For those who find them useful and valid, quantitative decision approaches are available. A few basic notions and references are listed below. Be careful in using them since the results may seem objective and authoritative, rather than simply a reflection of the assumptions they are based on.

6.1 Quantitative Methods

Formal methods have been developed for comparing different types of impacts in order to arrive at a decision*.

a. Use a Common Measure for All Issues. One can measure all impacts on a single scale, expressed in dollars** or positive/negative "points". Impacts can then be summed, giving a positive or negative overall result. This is the basic principle of cost-benefit analysis***.

One might, for example:

(1) Assign a weight to each issue, based on its relative importance, with all the weights adding to 100. One might give traffic congestion, say, a weight of 20, job opportunities 30, and so on.

(2) Rate the proposal's impact on each issue. A very good impact might be +2, an insignificant impact 0, a very bad impact -2.

(3) Multiply the rating times the weight for that issue (e.g., very bad congestion = weight of 20 x rating of -2 = -40 points).

(4) Add up all the results (from step 3).

(5) If the total is positive, or more positive than the alternative (estimated in the same way), and one believes the method and particular numbers, then approve the proposal.

The problem, of course, is who assigns the weights. Each person in the community has his own values; a job-seeker might give new jobs a weight of 80, someone else a weight of 20.

b. Weight by Interest Group. A further refinement is to have representatives of each interest group in the community assign

*Douglas C. Dacy, Robert E. Keunne, and Martin C. McGuire, Approaches to the Treatment of Incommensurables in Cost-Benefit Analysis, Prepared for the National Science Foundation by the Institute for Defense Analysis, Program Analysis Division, Arlington, Virginia, 1973.

**Be sure to include all non-monetary impacts.

***See, for example, Otto Eckstein, Water-Resources Development: The Economics of Project Development, Harvard Univ. Press, 1958; Harley Hinrichs and Graeme Taylor, eds., Program Budgeting and Benefit-Cost Analysis, Goodyear, 1969; E.J. Mishan, Cost-Benefit Analysis, Praeger, 1972.

weights and rate the proposal*. The process thus far may be instructive for participants and results may be enlightening for public decision-makers (also explosive when the decision eventually goes against particular groups).

The final step is then to weight the views of each group and sum across the groups. The obvious problem is how weights are assigned to each group in the community: number of people, proximity to the proposal, political power, political powerlessness? We don't know of any easy or "correct" solutions.

STEP 7. ASSURE COMPLIANCE WITH PROPOSAL

The community may wish to rezone a site after reviewing the developer's preliminary scheme. How can they be confident that what gets built after rezoning is in fact what the community had intended and desired? There are several approaches.

a. Careful Amendment. The zoning amendment or the rest of the bylaw can be carefully modified to reflect findings of impact studies. Thus, only a very narrow range of uses might be allowed in a proposed commercial zone.

For example, the Town of Bourne determined that a proposed research laboratory would have benefits outweighing detriments if actually developed as proposed. The town therefore amended the zoning bylaw to allow the following at that location, but no other business uses:

"Marine Research - Industrial or commercial experimentation and/or design and/or production of prototypes, exclusive of volume or continuous production, which requires location adjacent to the ocean.

Facilities for marine research are permitted on Special Permit in the R-20 District, but only if conforming with the following:

- Lot area of at least five acres, and of at least one acre per employee.
- No research activity or parking shall be located within sixty feet of any lot line of an adjacent owner.
- All structures, research activity, and parking are to be screened from adjacent premises by plantings or fences.

*See Julie Hetrick Schermes, "Interest Group Assessment in Transportation Planning", Traffic Quarterly, January, 1975; J.K. Friend and W.N. Jessop, Local Government and Strategic Choice, London: Tavistock Publications, 1969 (pages 177-193 provide a somewhat different approach).

- Any nighttime illumination shall not cause glare on adjacent premises.
- Frontage shall be on a way not less than forty feet wide."

Exactly such a use was developed, and as expected, was an asset.

b. Require Special Permit for Certain Uses. Where criteria are difficult to specify in advance or on a general basis, it is often appropriate to require Special Permit approval for the proposed type of development. Special Permit procedures provide an opportunity to review the final development plan and to attach conditions, including the condition that the plan be complied with, and possibly including bonds or covenants where appropriate.

c. Receive Property Interest in Part of the Land. In controversial situations, additional assurances about details of the development may be desirable at the time when City Council or Town Meeting votes on the rezoning. The developer may be willing to make such assurances and to guarantee them by giving the community some property interest in the land before the community votes on rezoning.

The Sylvania Corporation and Newton, for example, worked out an understanding on details of future industrial development on Sylvania's property. Sylvania then sold Newton an option to purchase some of its land. One condition of the sale, enforceable by the City, was that Sylvania would refrain from using the land in question for many uses which would have been allowed should the land be rezoned. Newton then rezoned the land, an action upheld by the courts*.

Be careful. Such arrangements require expert legal assistance. To be effective and legal:

- the community must receive a property interest in the land**; and
- the arrangement must be officially separate from the rezoning; it may influence but not bind the subsequent vote on rezoning.

* * * * *

Following is the impact summary for Drum Hill rezoning in Chelmsford. It may help illustrate the process of analysis outlined in this chapter.

*Sylvania v. City of Newton, 344 Mass. 428 (1962).

**Massachusetts Department of Community Affairs, Public Law Memo, No. 46, September 13, 1972.

CHAPTER 1A

IMPACT SUMMARY: DRUM HILL REZONING

We have been asked to review the impacts of commercial rezoning near Drum Hill rotary in Chelmsford. Chelmsford's recent Comprehensive Plan recommended rezoning about 60 acres at the Drum Hill Rotary from limited industrial (IA) to shopping district (CC) in order to allow construction of a regional shopping center*. The site is northeast of the rotary, lies behind existing stores on Drum Hill Road, and extends to the Lowell border and the former Middlesex Training School (Figure 1). The land was once used as a gravel pit but is now vacant.

Since rezoning was first discussed, a developer has in fact purchased options on the property and has proposed a regional shopping center to serve the whole Lowell area**. The proposed center would be about the size of the Burlington Mall. If built, it would be the largest single commercial development in the history of the town and one of the largest in the state. The evident developer interest and the potential scale of development suggest that the town carefully consider the advantages and disadvantages of rezoning.

We have tried to clarify the consequences of rezoning. We have not made an overall recommendation for or against the proposal. That is a local judgment.

POTENTIAL DEVELOPMENT

Possible development consequences of either approving or rejecting rezoning are shown in Table 1A-1 and described below.

1. If You Approve Rezoning

We have used the developer's scheme to illustrate potential impacts of rezoning, since it is about the most extensive development realistically imaginable on the site. When complete, such a shopping center could include 4 department stores, about 1.3 million square feet of floor area, and 6,500 parking spaces. Note, however, that:

a. Such development is far from certain. Rezoning could result in a smaller amount of development or even in none, if sales potential, economic conditions, department store interest, or other government approvals do not work out. Chelmsford zoning is only one hurdle. As currently planned, the center requires Lowell rezoning on adjacent property and State D.P.W. approval of a curb cut on

*William Melia, "Comprehensive Plan, Phase One", June, 1975.

**General Growth Development, "Importance of the Mall to the Community", 1975.

FIGURE 1 : PROPOSED ZONING AND PROPOSED SHOPPING CENTER.

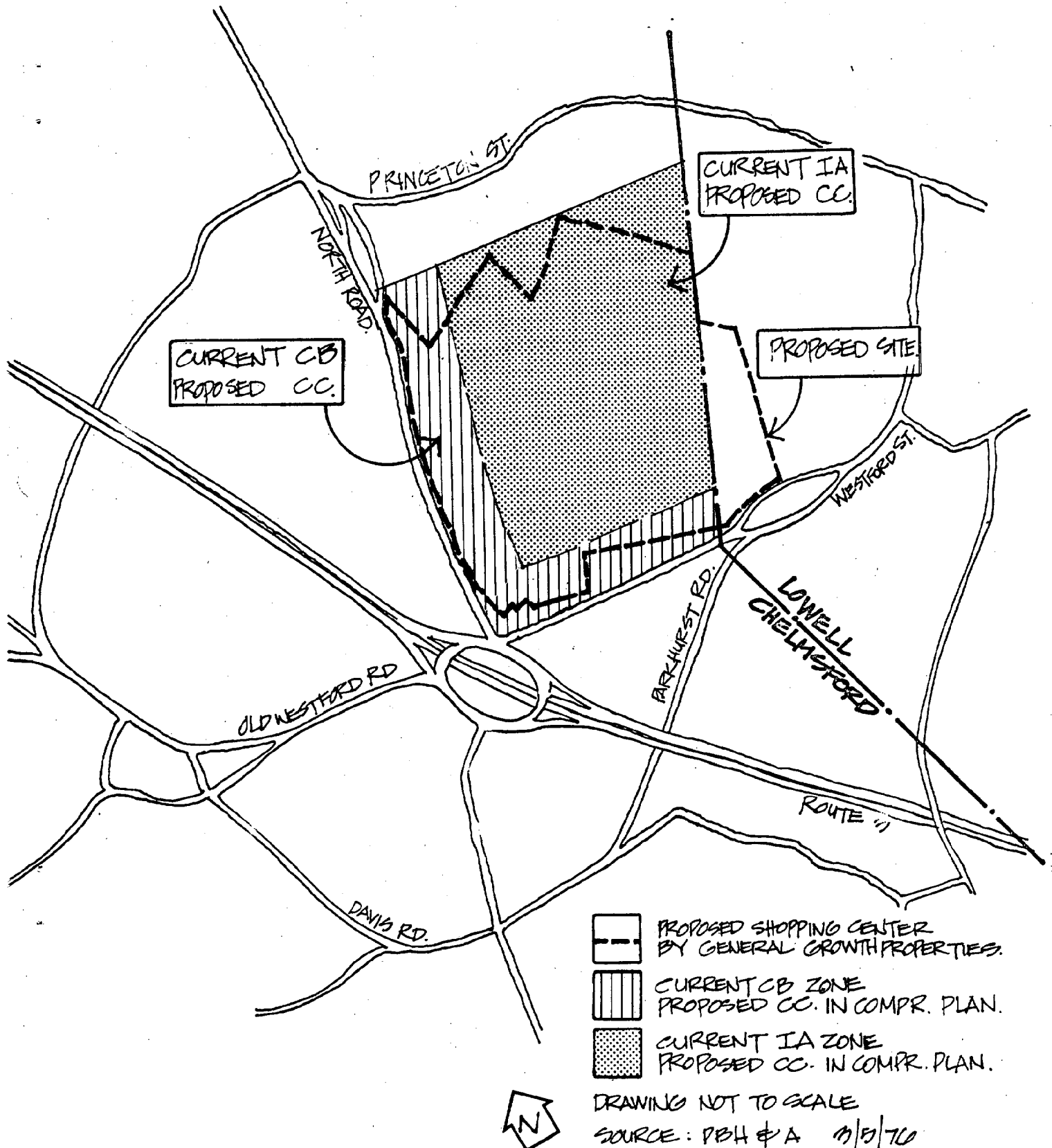


Table 1A-1
POTENTIAL DEVELOPMENT

	Current Zoning	Proposed Zoning
Area involved	63 \pm acres	63 \pm acres
District	IA	CC
Possible type of development	industrial park	regional shopping center
Possible gross floor area if site developed	550,000 s.f. ^a	1,260,000 s.f. ^b
Probability of full development within 5 years	15%	50%

^a Assumes floor area equals 20% of land area.

^b Based on Derwood Quade, site plan for "The Mall"; includes malls and corridors, excludes buildings not affected by rezoning (now in commercial district or in Lowell)

See Appendix

North Road. A reasonable judgment is that the center has about a 50% chance of being built within 5 years if given rezoning.

b. If a regional center is not built, the site may well remain vacant. Lack of visibility and rugged topography may deter small-scale development.

c. The center might be built very differently than shown on the developer's preliminary plan. For example, more buildings could be shifted into Lowell, substantially reducing Chelmsford's tax benefits.

2. If You Reject Rezoning

The town can keep the current zoning, with the following development consequences:

a. A large industrial park might be built on the site. Chances seem slight, however, perhaps 15% in the next 5 years, given recent industrial demand in the town and other available sites. Of course, one day some other proposal not now anticipated might be made for the site.

b. Denied at this location, commercial development will probably occur elsewhere in the region. A regional center might be built in Lowell or Tyngsborough or further away. Impacts on Chelmsford would be altered but still important.

FISCAL

A regional shopping center would pay substantially more in local taxes than it costs in local services. We estimate that such a center could reduce Chelmsford's tax rate by about \$1.00 (Table 1A-2). This is a significant benefit although much less than the \$3.00 reduction mentioned in the Comprehensive Plan. Our estimate is lower than that in the Plan because we have (a) estimated somewhat lower assessments*, (b) deducted for town costs (e.g., for police and fire services), and (c) considered effects of reduced state aid which would result from increased local assessed valuation. State aid formulas may change, but probably not enough to wipe out the tax benefits of the shopping center.

An industrial park would be considerably smaller, costing less to service but also paying less in taxes. We estimate that it might reduce the tax rate by \$0.30-\$0.40, about 1/3 as much as the shopping center.

When the uncertainties of development are considered, "expected" tax benefits are much lower: perhaps \$0.50 for the proposed zoning, \$0.05 for current zoning.

*\$15 million, smaller than the \$20 million mentioned in the Comprehensive Plan but larger than the \$13 million estimated by the developer ("Importance of the Mall to the Community").

Table 1A-2
TAX RATE CHANGE

	Current Zoning	Proposed Zoning
Annual Costs & Revenues if Full Development		
Revenues	\$183,000	\$628,000
- School Costs	0	0
- Non-School Costs ^a	22,000-55,000	74,000-174,000
- State school aid loss	57,000	192,000
- Street improvements (average year debt service)	0	15,000
= Total annual fiscal gain	71,000-104,000	247,000-347,000
Possible Reduction in Tax Rate	\$0.29-0.39	\$0.88-1.23
Probability of Full Development within 5 years	15%	50%
"Expected Value" of reduction in tax rate (rounded off)	\$0.05	\$0.45-0.60

^arange, reflecting possible costs for fire, police, highways, etc.

TRAFFIC

To be successful, a regional shopping center would involve an enormous amount of traffic. We estimate that 50,000 trips would begin or end at the center each day. (For comparison, North Road now carries about 12,000 trips a day). As a result, traffic might double on Drum Hill rotary, Drum Hill Road, Westford Street (in Lowell) and North Road (from the site to I-495). The result would be severe congestion (especially evenings and Saturdays) unless and until these streets and the rotary are improved to increase capacity. Simple incremental improvements seem feasible except at Drum Hill rotary. We don't know of any simple solutions if, as it appears, the rotary cannot handle the extra traffic without many hours of congestion. Total redesign, reconstruction, and enlargement might be needed, possibly in conjunction with a new route 213. This raises serious concerns about the feasibility, timing, and desirability of a regional shopping center at this location.

Other concerns include:

- a. the exact location of shopping center driveways, to provide adequate separation from other driveways and intersections;
- b. traffic increases at hazardous locations elsewhere in town (e.g., North Road at Dalton Road);
- c. added traffic noise, pollution, danger in residential neighborhoods (e.g., along North, Old Westford, and Graniteville Roads).

An industrial park would only add about 5,000 trips a day, 1/10 as many as the shopping center. It would therefore have much smaller impacts in all these respects.

ECONOMIC

We estimate that a regional shopping center might provide 2,200 permanent jobs (close to the developer's estimate of 2,400). This would be about twice as many jobs as an industrial park on this site (Table 1A-3). Many shopping center positions are relatively low-paying (average annual wage is less than \$6,000) but they do provide opportunities for Chelmsford housewives, teenagers, and workers seeking second jobs. The center would significantly increase job opportunities within the town itself, reducing net out-commuting.

Commercial development is much more likely than industrial development on the site. Expected job benefits (even, surprisingly, blue-collar jobs) are therefore much greater under commercial zoning.

The center, fully developed, appears likely to "capture" about 1/7 of the sales in existing Chelmsford stores. Competition will be most severe for variety, discount, clothing and furniture stores. Unless there is substantial population and income growth, some vacancies will be created somewhere. On the other hand:

Table 1A-3
EMPLOYMENT IMPACTS

Impact	Timing	Probable jobs created under:	
		Current Zoning	Proposed Zoning
Construction jobs in peak years ^a	Expected in 5 yrs. Full development	10 70	140 270
Permanent jobs	Expected in 5 yrs. Full development	150 1,000	1,100 2,200
Craftsmen, operatives jobs	Expected in 5 yrs. Full development	90 590	180 350
Total Payroll	Expected in 5 yrs. Full development	\$ 1,530,000 10,200,000	\$ 6,050,000 12,100,000
Increase in employment within Chelmsford ^b	Expected in 5 yrs. Full development	3% 21%	23% 45%

^aMan-years on-site labor

^bPermanent jobs compared to 1974 covered employment.

a. Competition might occur to some extent anyway (e.g., if rezoning is rejected and the center is built in a nearby community).

b. The center will bring out-of-town shoppers to the Drum Hill area, inducing sales at nearby stores which exist now or might be built in the future.

c. The center's small shops may provide opportunities for local entrepreneurs.

The center may also increase values of nearby commercial properties while reducing values of residential properties, especially those along traffic-impacted routes.

PUBLIC FACILITIES

Development at Drum Hill isn't likely to require very extensive public improvements other than for traffic, as discussed earlier. Larger water mains may be needed in the area for either a shopping center or an industrial park. We don't know of any other pressing issues, although some types of industrial development might pose particular problems (e.g., very heavy water demand).

SOCIAL IMPACTS

Social impacts of Drum Hill rezoning are not likely to be critical. A regional shopping center would, of course, broaden residents' shopping opportunities and might affect people's image of the community (Burlington Mall is a dramatic example). It will also provide a meeting place and hang-out for many, notably young people. We don't think the center will bring new residents to Chelmsford or have major visual effects on the Drum Hill area.

Some of the employees of an industrial park might move to Chelmsford, but this effect would probably be minor.

REGIONAL IMPACTS

It may be worthwhile to briefly consider regional impacts, although they have not been the focus of this analysis. The proposed shopping center would be seriously competitive with the struggling commercial renaissance of Downtown Lowell. There are a number of ways that Chelmsford residents can think about that.

a. Chelmsford residents have a stake in the future of Downtown Lowell. Many have jobs, investments, or businesses there, and even more are served or could be served by the rich mixture of activities planned there. Hurting Downtown Lowell hurts Chelmsford residents as well as the City of Lowell.

b. Failure to reflect regional concerns in local decisions could have a backlash. The City of Lowell, NMAC, and various state agencies might well hesitate to help a community which acted in selfish disregard for the interests of the broader region.

c. There is an ethical responsibility to the region, even if the first two points aren't applicable.

d. On the other hand, one might conclude that the proposed Drum Hill center isn't really contrary to the best interests of the region; that the region is better served by allowing the center than by the suburban scatteration of smaller-scale commerce which might result, Lowell's plans notwithstanding, if the center were refused here.

In some states and in one county in this state, decisions on developments of this scale are made by a regional body, not local ones. Responsible local behavior will make such loss of home rule less imminent. Before a local decision is made, the NMAC should, as a minimum, be consulted.

SUMMARY

Table 1A-4 summarizes key potential consequences of rezoning. Taxes and jobs are the most persuasive reasons for rezoning. Problems resulting from traffic are the major drawbacks. In considering these issues, two judgments should be made:

- should a shopping center be allowed at that site?

- if the answer is yes, what, if any, safeguards should be provided?

Following are some important considerations in making these judgments.

1. Deciding Whether to Rezone

a. Traffic problems should be weighed against job and tax benefits.

b. Don't turn down the proposal if you think that the shopping center might then be built over the town line in Lowell. Such a center would have the same traffic problems but would not pay taxes to Chelmsford.

c. Before rezoning the area, the town should obtain a professional traffic analysis of the shopping center's effect on the rotary, which is the most difficult traffic issue. Analysis might be provided by the D.P.W., the developer, or a private traffic engineer hired by the town. The findings of this analysis should be reviewed with the state D.P.W. Key questions are how the D.P.W. might respond to the curb cut application and how they might deal with the rotary. Review may give a better sense of whether and when a shopping center could happen.

Table 1A-4
CONSEQUENCES OF REZONING

Impact	Evaluation	Description
<u>Major Consequences</u>		
Tax Rate	Good	Reduce tax rate by as much as \$1.00 (2% reduction; if one's house is assessed at \$30,000, save \$30 a year)
Job Opportunities	Good	Increase jobs within Chelmsford by up to 45%; make jobs more accessible to residents. However, some jobs would be available to residents wherever center is built.
Traffic	Bad	Severe congestion in Drum Hill area; may require rebuilding of Drum Hill rotary. Increases noise, pollution, and dangers along North Rd., Graniteville Rd., Old Westford Rd.
<u>Other Consequences</u>		
Competition	Bad	May capture 1/7 of current Chelmsford sales. However, some competition would still occur wherever center is built.
Shopping Opportunities	Good	Increase range of stores easily accessible to residents.

2. Deciding on Safeguards

As originally drafted, the proposed zoning amendment would allow a shopping center outright in the new CC zone. The Planning Board would review the final site plan, but its review would only be advisory (Proposed Zoning Bylaw, April, 1975, Section V and XIII)*.

We think that additional safeguards are appropriate when dealing with such a large potential development. If the site is to be rezoned, rezoning might reasonably be combined with the following additional actions.

a. Require Special Permit for Shopping Centers. Such major developments should be allowed only on Special Permit. Special Permit procedure would provide public review of the specific development proposal. One could then note the exact number and placement of driveways (a traffic safety concern) and location of buildings (a fiscal issue if some of the buildings are located across the town line in Lowell). A public hearing would be provided. The town would be able to impose conditions on the development.

Such Special Permits might be assigned to the Planning Board (now allowed under state law). The Planning Board could also provide either advisory or binding site plan review, whether or not designated as the special permit granting agency.

b. Revise Special Permit Criteria and Submission Requirements. For example, Special Permit criteria already deal with traffic impacts, including "congestion, hazard, or substantial change in established neighborhood character." (Sec. 11.1.2, Chelmsford Zoning Bylaw). It is possible to make these criteria more precise and to require the developer to submit a professional traffic analysis demonstrating compliance (see "Traffic Impacts").

c. Adopt Curb Cut Bylaw. The town might consider a bylaw controlling curb cuts on town roads, roughly similar to D.P.W. control over state roads. Criteria might include safe egress, clearly defined (not continuous) driveways, distance from other driveways, and the developer's agreement to share in street improvements needed to make the egress safe.

*NOTE: Bylaw amendments must now conform to the new state zoning law, Chapter 808 of the Acts of 1975. The 1975 proposed bylaw must therefore be modified in at least some respects before it can be adopted.

APPENDIX : BASIS OF ANALYSIS

Development consequences of current and proposed zoning were estimated as follows.

CURRENT ZONING

Full Development

Current zoning allows industrial development on the site. What scale development seems realistic? We have assumed that an industrial park might be built, with floor area of buildings totaling 20% of land area or 550,000 sq. ft. This is below the maximum density permitted in the IA zone (30% floor area ratio), but is higher than the actual density of most recent factories and warehouses in Chelmsford. For example, the Curry plant has a floor area ratio of 13%, the Pellon plant 19%*.

Probability of Full Industrial Development

Full industrial development of the site does not seem very likely within the next few years, based on the following.

a. Industrial growth in the whole town only averages about 15 acres a year**. If all Chelmsford's industrial growth took place on this site, it would still take 4 or 5 years at that rate to develop the 63 acres.

b. The site is only one of many vacant, industrially zoned areas in the town.

c. Other areas may be more attractive for industry. For example, industrial development has recently been attracted to the Billerica Road area, where there are still several hundred acres available.

d. The site is therefore likely to attract only a fraction of future industrial growth in the community.

We have therefore assumed a low probability of development, 15% by the end of five years.

*Based on data from the assessors' office.

**Comprehensive Plan shows industry occupied 78 acres in 1962, 246 in 1973. Growth was therefore about 168 acres in 11 years, or about 15 acres a year.

PROPOSED ZONING

Full Development

General Growth Properties has proposed a regional shopping center for the site, to be built in two stages*. We have used their "ultimate" center to illustrate possible impacts on the site given rezoning.

Based on the developer's preliminary site plan, rezoning might lead to development of 1,260,000 s.f. floor area. This was estimated as follows:

1,175,000	sq. ft. gross leasable area of ultimate center
+ 141,200	sq. ft. non-leasable area (malls, etc.)
<u>1,316,200</u>	sq. ft. total floor area
- 55,000	sq. ft. not affected by rezoning (now in commercial district, or in Lowell)
<u>1,261,200</u>	sq. ft. total floor area affected by rezoning
say 1,260,000	sq. ft.

Probability of Full Commercial Development

A regional shopping center is an enormously complex undertaking. Lots of things can go wrong. The center may never be built, despite the best intentions on the part of the developer. Some major uncertainties:

a. Sales potential. Can this area support a million sq. ft. center? The developer thinks so. We'll assume he's correct, although we're somewhat skeptical**.

b. Economic conditions. Like many major proposals, this one is based on optimistic assumptions about personal income and the economy. The center may not get built if the recession continues or gets worse.

c. Prime tenants. Development depends on commitments by several major department stores. We don't know of any such commitments so far. If one or more retailers were already involved (as tenant or partner) everyone could be much surer about the center getting built.

d. Government approvals. Chelmsford zoning is only one hurdle. The biggest problem may be in Lowell. As we understand it,

*"Importance of the Mall to the Community".

**Population growth is a key element in the developer's preliminary market projections. However, the State Census indicates that the Lowell metropolitan area has been growing slower since 1970 (less than 1% per year) than they, and perhaps others, would have projected using growth data from the sixties.

rezoning may be needed to locate one egress and part of the parking there*. Lowell approval isn't a sure thing, since Lowell is likely to get lots of traffic, little taxes, and much lower sales downtown. There may also be some problems obtaining State Department of Public Works approval for a curb cut on North Road. New state policy may discourage major shopping center development, e.g., by requiring the developer to pay for all needed improvements on the abutting state highways.

In light of these uncertainties, we assume a 50% chance of development in the next 5 years or so. If anything, this is optimistic**.

*The site plan might be redesigned but either (a) more frontage would be needed on Drum Hill Road for another egress or (b) traffic impacts would be even worse.

**Note: If major development doesn't happen, the site may not be developed at all. The distance from the road and rugged topography make small-scale development unlikely.

CHAPTER 2

TRAFFIC IMPACTS

Traffic analysis can be conducted at several levels of detail. Lay officials and citizens can make rough estimates of the traffic impacts of a proposal, or professional traffic engineers can be asked to provide a more thorough, elaborate and precise analysis.

This chapter outlines a set of quick methods and background information for non-professionals. These may be useful for determining possible impacts, for deciding whether a professional analysis is needed, and for reviewing a professional analysis.

In addition, at the end we've suggested how a community might require developers to submit professional traffic analyses as part of Special Permit applications. In this way the community could shift the burden of analysis to those proposing major traffic generators.

Whether traffic analyses are conducted by laymen or professionals, they should generally focus on the following questions:

a. To what extent will traffic hazards increase on nearby streets? This is often the most urgent and serious concern about new development.

b. To what extent will there be congestion on nearby streets?

c. How will added traffic affect the quality of life on nearby streets, whether or not there are major safety or congestion problems?

In addition, the analysis should identify possible actions by the developer or the community that would make the above impacts less serious. This might suggest conditions for approving the proposal (e.g., shift the entrance, reduce the size of the development) and indicate the extent of related public street improvements.

1. AMOUNT OF TRAFFIC

In order to analyze the traffic impact of a proposal, one has to estimate how much it will increase vehicle trips. This involves the following steps.

1.1 Estimate Traffic From Proposed Development

The first step is to estimate the total amount of traffic that will be "generated" by the proposed development. This is usually measured as the total number of vehicle trips which begin or end on the site on an average day*. Estimates can be based on studies of existing developments throughout the country; some results are summarized in Table 2-1.

The following should be kept in mind when using these or other numbers:

a. These numbers are only rough guides. Studies show a wide, and often unexplained, range of results, suggesting caution and skepticism in applying general findings to a particular proposal. In fact, each professional analyst who looks at a proposal will probably come up with a somewhat different traffic estimate, based on his judgment and experience. Where the estimate is far outside the common range in Table 2-1, however, one should ask how the number was estimated.

b. Make sure estimates are comparable. Some studies measure person-trips (not vehicle trips), peak hour trips (not daily trips), or round trips (not trips each way). One study may show trips per acre of industry, another per employee, and still another per 1,000 square feet of gross floor area.

c. These numbers assume almost all trips are by automobile. If transit and walking would account, say, for half the trips at a new development, simply reduce the Table 2-1 estimate by half.

1.2 Distribute Proposal Traffic on Nearby Streets

Traffic can't be distributed with any great precision. It is usually easiest to take the site plan and a street map of the surrounding area and think about where people are likely to be traveling (where residents go to work, where the developer's market study expects shoppers to come from, where there are major expressways). Likely routes and number of trips can be plotted on the map up to a certain distance, say $\frac{1}{2}$ mile. Not all routes need be thought out to the same distance; those with few trips don't need further consideration. Figure 2 shows how trips from a proposed development might be distributed.

*These are one-way trips. Each arrival is one trip; each departure is one trip.

Table 2-1
AVERAGE DAILY TRAFFIC BY LAND USE

LAND USE	Trips Per:	Average Daily Traffic (Vehicle Trips Per Day)	
		Average	Common Range
<u>Residential</u>			
Single-family	Dwelling Unit	8.5	6 - 14a, b
Multi-family	"	6.5	3 - 9 ^c
Mobile homes	"	6	4 - 9
<u>Commercial</u>			
Shopping centers			
regional (500,000+ gsf)	1,000 gsf	40	30 - 50 ^b
community (100,000-500,000 gsf)	"	80	50 - 110 ^b
neighborhood (-100,000 gsf)	"	100	60 - 130 ^b
Supermarket	"	130	100 - 150
Discount store	"	40	30 - 55
Drive-in bank	each	1,500	1,000 - 2,000
Gas station	each	400	300 - 700
Other stores	1,000 gsf	50	20 - 120
Fast food restaurant	"	600	400 - 800
Other restaurants	"	150	50 - 300
Hotels, motels with convention room facilities	room	9.2	8.5 - 11
Other motels	room	5.6	4 - 7
<u>Industrial</u>			
Manufacturing			
over 500,000 gsf	employee ^d	2.2 ^e	1.9 - 2.7
less than 500,000 gsf	"	2.9 ^f	2.5 - 3.3
Research and development	"	2.4 ^g	2.0 - 2.6
Industrial park	"	3.7 ^h	2.4 - 4.5
Warehouse	"	4.5 ⁱ	3 - 10
Truck terminal	1,000 gsf	12	10 - 15

Table 2-1 (cont.)

LAND USE	Trips Per	Average Daily Traffic (Vehicle Trips Per Day)	
		Average	Common Range
<u>Office</u>			
General office	1,000 gsf	11 ^j	9 - 17
Medical office	"	53	50 - 80
<u>Institutional</u>			
University hospital	bed	37	20 - 45
General hospital	"	14	8 - 22
Long-term care hospital	"	3.5 ^k	3 - 5
College	student	2.4 ^k	1 - 3
Airport ^l	acre	3.6	2 - 6
<u>Recreation</u>			
Stadium	spectator	1	0.8 - 1.3
Drive-in theater	parking space	2 ^m	1 - 2
Golf course	acre	6	2 - 10
Marina	boat berth	4	2 - 10

gsf = gross square feet building floor area

^aWithin range, higher if homes expensive, in outlying areas, and/or with young families and children^bNew England or East Coast estimates are used, since they are quite different from national averages^cWithin range, higher if large units (2, 3, and 4 bedrooms) and/or in outlying areas; very low if elderly residents^dIndustrial uses can also be estimated per 1,000 gross sq. ft. or per acre, but these are less reliable^eaverage = 4.2 per 1,000 gsf, 32 per acre^faverage = 4.9 per 1,000 gsf, 22 per acre^gaverage = 5.1 per 1,000 gsf, 73 per acre^haverage = 9.3 per 1,000 gsf, 76 per acreⁱaverage = 5.5 per 1,000 gsf, 73 per acre^jGovernment offices are higher, perhaps twice as high^kLower for junior colleges and for residential colleges^lFor small private planes^mAssumes full attendance

Table 2-1 (cont.)

Sources: Herr Associates estimates based on:

Dennis L. Hansen, Volume XV Travel Generation, National Association of County Engineers Action Guide Series, National Association of Counties Research Foundation, 1972.

Trip Generation by Land Use Part I, A Summary of Studies Conducted, Maricopa Association of Governments, Arizona, 1974.

Institute of Traffic Engineers, Committee 5N-S, "Guidelines for Driveway Design and Location", Traffic Engineering, February, 1973.

Herr Associates, "Performance Zoning II", for Franklin County Planning Department and D.C.A., June, 1972.

We suggest first distributing trips on each street as a percentage of the total (e.g., 20% on North St., 30% on South St., etc.). This assures that trips will add up to the total number from the proposal*.

1.3 Identify Critical Locations

Usually, only a few intersections and stretches of road need further study. These should be quickly identified:

a. Where traffic will increase substantially, say, by more than 25% above current levels. Proposal traffic should be compared with current traffic on each street, either from an available traffic count** or a rough guess at traffic on that type of street. Table 2-2 suggests the range of traffic for different kinds of streets.

b. Where traffic problems already exist. Even a slight traffic increase can be serious where frequent backups or accidents already occur. Local police keep accident records and sometimes have a map of accident locations.

1.4 Estimate Non-Proposal Traffic

Estimate traffic expected anyway at critical locations. Two steps are involved:

a. Determine present traffic. The local DPW, Highway Department, or Police Department may have traffic count data. Many towns have recent data collected for the TOPICS program of highway improvements. You can conduct a traffic count if no recent count is available***, or just guess. Use of Table 2-2 should enable a guess that will at least be "in the ballpark".

*Note: Steps 1.1 and 1.2 may exaggerate how many new trips there will be on each street. It is assumed that all proposal traffic is a net addition to nearby streets. In fact, some of the cars stopping at a gas station or store would have been on the street anyway. We don't know a good way to estimate (and subtract out) such traffic. Assuming all trips are new is probably quite accurate for residences and industries; it is probably least accurate for small stores on major roads. While assuming all trips are new may slightly over-estimate congestion problems, it does indicate safety hazards (e.g., heavy traffic to and from a driveway).

**From the local department of public works, a recent T.O.P.I.C.S. program in the community, or the Mass. Department of Public Works (which periodically publishes "Traffic Volumes", mainly dealing with state roads).

***A 24-hour counter may be used. On residential streets, simply count traffic during the evening rush hour (usually about 4:30-5:30 P.M.) and multiply by 10 to get a rough estimate of daily traffic. Incidentally, an evening rush hour count is also useful for evaluating congestion (page 45).

Figure 2: SAMPLE TRIP DISTRIBUTION FOR A RESIDENTIAL DEVELOPMENT

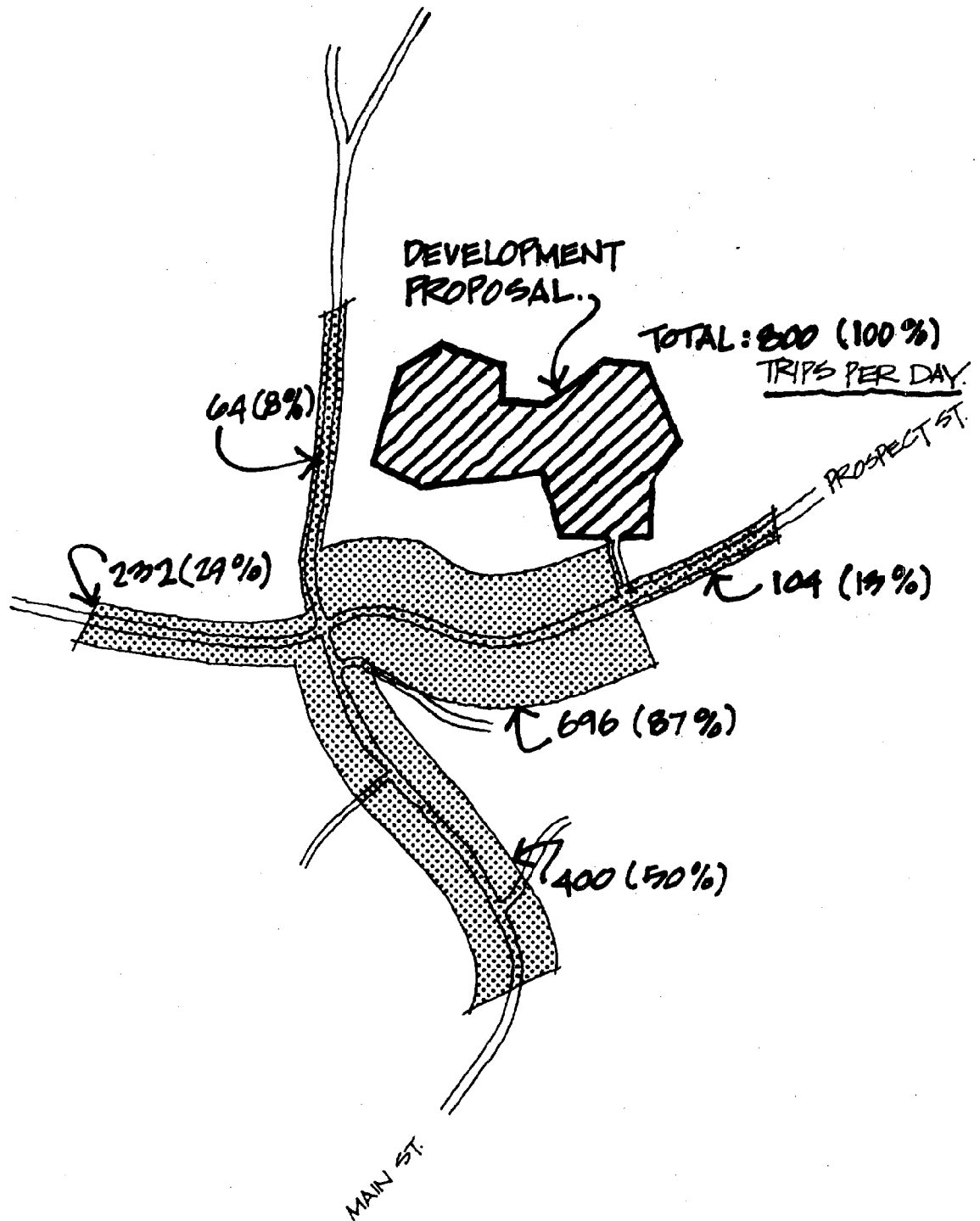


Table 2-2
COMMON TRAFFIC VOLUMES

Type of Road	Average Daily Traffic
<u>Community Streets</u>	
Lane or dead-end street	75- 350
Local street serving abutting property	100- 1,000
Collector street serving local streets	800- 3,000
Arterial street distributing traffic throughout communities of 5,000+ population (often the main shopping street)	
minor (connects neighborhoods or entire small communities)	3,000- 7,000
major	7,000-30,000 ^a
<u>State and Federal Highways</u>	
Secondary highways, relatively short, connecting centers of up to 15,000 population each (e.g., routes 6A, 32, 63, 119)	1,000- 8,000
Primary Highways (e.g., US 20, US 5, US 44, Rte. 9, Rte. 140)	5,000-35,000 ^a
Limited Access Highways (e.g., I-91, I-93, Rte. 3, Rte. 128)	20,000-120,000 ^a

^aHigher part of range usually occurs in large metropolitan areas

Sources: Massachusetts Department of Public Works, "A Statewide Highway Transportation Plan", 1968
Massachusetts Department of Public Works, "1974 Traffic Volumes"
Urban Land Institute, American Society of Civil Engineers and National Association of Home Builders, "Residential Streets: Objectives, Principles, and Design Considerations", 1974.

b. Add traffic expected from other nearby development (if any). Other new development may be built along the road in the next few years. Its potential traffic should be estimated (Steps 1.1 and 1.2), in order to get a realistic picture of long-term traffic on the road*.

1.5 Estimate Percentage Increase in Traffic

Compare proposal traffic with traffic expected anyway at critical locations:

$$\% \text{ Increase in traffic} = \frac{\text{Proposal Traffic}}{\text{Non-Proposal Traffic}} \times 100$$

1.6 Evaluate Impacts

Traffic increases at critical locations should be evaluated in terms of safety, congestion and quality of life. In evaluating a proposal, one should compare it with what (if any) development seems likely on the site if the proposal is rejected. To do this,

- a. imagine a realistic alternative development;
- b. estimate its traffic impacts in the same way that the proposal was evaluated;
- c. consider how likely development actually is if the proposal is approved and if it is rejected. For example, a community may consider industrial zoning simply to prevent development in one part of town. Traffic impacts of possible industrial parks may not have to be taken very seriously. But if residential development were likely under present zoning, its potential traffic impacts should be given much more importance.

*It may be hard to predict whether (and when) large vacant areas near the proposal will be developed. The traffic estimate should be adjusted to reflect the fact that development may not occur for many years. One can do this by (1) estimating potential traffic from the area (if fully developed) and (2) multiplying this by the probability of development occurring within a certain number of years (say 5 or 10). For example, say there are 500 acres of vacant land near the proposal. There seems about a 40% chance that the land will be developed with single-family homes within the next 5 years. Expected traffic can be estimated as follows:

500	acres of vacant land
x 2	# of dwelling units per acre (current zoning)
1,000	possible # of dwelling units
x 8.5	trips per dwelling unit (Table 2-1)
8,500	possible total trips from vacant site
x .50	proportion using North Street
4,250	possible trips using North Street
x .40	probability of full development within 5 years
1,700	expected trips from now-vacant land near proposal

2. SAFETY

Increased traffic greatly increases the danger of accidents, even if the road isn't especially hazardous. It becomes much more likely that cars (and pedestrians) will conflict with each other. This may cause accidents and force drivers and pedestrians to change the way they use the street: children stop playing in the street, pedestrians cross only at corners, drivers slow down; stop signs, traffic signals and street lights may be installed.

Dangers are much greater if there are any hazardous road conditions. Following are some features to watch out for.

2.1 Adequacy of Existing Roads

Where traffic will increase substantially, watch out for the condition and layout of the existing road. The road may be quite safe for current volumes but too narrow, winding, hilly or poorly paved to safely handle traffic from the proposed development. Few streets, for example, have alignments which can handle a 30% traffic increase without becoming hazardous. The following sources may suggest whether the road is adequate for the extra traffic.

- a. past accident records, from local police;
- b. review by the highway surveyor or superintendent, and local police;
- c. where a state road is involved, review by the area office of the State Department of Public Works;
- d. road design standards in local subdivision regulations.

Various rules of thumb have sometimes been suggested*, but what is considered adequate varies widely from one community to another. Bellingham, for example, requires that subdivision streets serving 50+ homes must have 36 ft. wide pavements. The same type of street under some circumstances in Oak Bluffs is only required to be 14 feet wide.

2.2 Entrances and Exits

Even if a proposal only increases street traffic slightly, one should pay attention to the location and design of entrances and exits. Egresses often create hazards, some of which can be easily modified by changing the site plan. Key factors to look out for include:

*See: Urban Land Institute, American Society of Civil Engineers and National Association of Home Builders, "Residential Streets: Objectives, Principles and Design Considerations", 1974; Kevin Lynch, Site Planning, Cambridge: M.I.T. Press, 1971.

a. Distance from other driveways and intersections. Where these are very close, turning movements conflict and drivers weave from one lane to another. Problems may occur where the driveway is less than:

- 250 feet from an intersecting street
- 250 feet from the driveway of a major traffic generator across the street*
- 500 feet from the driveway of a major traffic generator on the same side of the street.

b. Number of egresses. Designs which avoid continuous or frequent driveways are likely to be safer than those with such driveways.

c. Sight Distances. How far can the driver see to the right and left before he turns onto the street? Table 2-3 shows sight distances suggested by the National Association of County Engineers**.

Table 2-3
SUGGESTED SIGHT DISTANCES FROM DRIVEWAY

Speed on Street	To Left		To Right
	2-lane street	4 or 6-lane street	
30 mph	350 ft.	220 ft.	260 ft.
40	530	380	440
50	740	620	700
60	950	950	1,050

Source: Hansen, Travel Generation

This suggests that egresses should not be near hillcrests, around curves, or near embankments. Less permanent features, such as trees, shrubs, fences and parked vehicles can also block the driver's vision. In some cases it may be appropriate for the developer to grant a sight easement to the community, assuring that underbrush will be kept cleared or that a fence will be removed.

d. Left Turn Movements. Heavy left turn movements to or from the driveway can be especially dangerous.

*Unless the other driveway is exactly opposite, simply creating a 4-way intersection.

**Sight distances are measured 10 ft. back from the curb; the driver's eye is assumed to be 3.5 feet above the ground, objects are assumed to be 4.5 feet above the ground. Distances should be increased by 10% for rural areas and greatly increased for trucks.

e. Pedestrian Flow. The driveway may cross (and conflict with) heavy pedestrian traffic along the street.

3. CONGESTION

Proposal traffic can create (or worsen) traffic jams on nearby streets. Traffic engineers have complex methods for estimating congestion, but a simpler approach can also suggest how jammed streets will be.

Congestion depends on the amount of traffic and the "capacity" of the road or intersection. If traffic volumes are large compared to capacity, major delays may occur. One can predict how the proposal will increase peak hour traffic, and then estimate the extent of service deterioration resulting from that. The following steps are involved.

3.1 Select Location(s) to be Analyzed

Identify places where congestion is likely to be worst, generally where traffic will increase most substantially or where backups already occur (Step 1.3, page 40). If traffic will increase all along a road, congestion will usually be worst at major intersections (where traffic movements cross) or at obstructions (e.g., where the road is narrowest).

3.2 Select Hours to be Analyzed

Decide when congestion is likely to be worst, that is, the peak hour each day. Tables 2-4 and 2-5 can help select the appropriate hour to be analyzed. The peak hour is usually the evening rush hour (about 4:30-5:30 P.M.) but may be earlier or later if the proposal represents a large share of traffic and has its highest traffic at another hour (Table 2-5).

If traffic is much greater during a certain part of the year (e.g., at a ski area, summer resort, college town), the high-season peak hour is critical and should be analyzed.

3.3 Estimate Current Peak Hour Traffic

Sources and methods are basically the same as for estimating daily traffic (Step 1.4a, page 40). Several approaches are possible:

- use an available peak hour traffic count;
- count traffic during the peak hour; or
- guess, estimating what share of daily traffic occurs during the peak hour (Table 2-4; on most streets, evening rush hour traffic is about 10% of daily traffic).

Table 2-4
EVENING RUSH HOUR TRAFFIC

Type of Land Use	Approximate % of Average Daily Traffic	Approximate % Outbound
Residential	10	35
Commercial	10	50
Colleges, hospitals	10	65
Industrial	18	80
Office	22	80

Source: Herr Associates estimates based on sources in Table 2-1.

Table 2-5
UNUSUAL PEAK TRAFFIC TIMING

Land Use	Highest Hour	Approximate % of Average Daily Traffic	Approximate % Outbound
Stadium, drive-in theater	end of last show	45	almost 100
Regional shopping center	7-8 PM	10-15	45
Major college or hospital	usually morning rush hour	10-15	15
Industrial plant	Depends on shift schedule:		
	beginning of shift	15-35	20
	end of shift	15-35	80

Source: Herr Associates estimates based on sources in Table 2-1 and Louis Keefer and David Witheford, Urban Travel Patterns for Airports, Shopping Centers and Industrial Plants, Highway Research Board, 1966.

NOTE: if the street has more than 1 travel lane in each direction, it would be best to estimate traffic and go through the following steps for each direction on the street.

3.4 Estimate Non-Proposal Future Peak Hour Traffic

How much traffic is expected at the location if the proposal isn't built?

- a. Determine daily traffic from future nearby development (Step 1.4b, page 42).
- b. Estimate what share of that traffic will occur during the peak hour (Tables 2-4, 2-5).
- c. Add this to current peak hour traffic.

3.5 Estimate Future Peak Hour Traffic Including the Proposal

- a. Estimate daily traffic from the proposal at the location (Step 1.2, page 36).
- b. Estimate what share of proposal traffic will occur during the peak hour (Tables 2-4, 2-5)*.
- c. Add this to the non-proposal future peak hour traffic.

3.6 Calculate the % Increase in Peak Hour Traffic

Compute the percentage increase (above current peak hour traffic) expected with and without the proposal.

3.7 Judge the Current Peak Hour "Level of Service"

Table 2-6 and Figure 3 describe levels of traffic service which result from the relationship of traffic demand and street capacity. People can usually quickly agree on which level best describes the current situation. The level can also be calculated, but that is complex and, by our observation, subject to a great deal of error even when done by professionals.

If you want a numerical check, the following usually result in level C service:

- 350-500 vehicles per hour per travel lane at intersections
- 400-500 vehicles per hour each way on uninterrupted two-lane roads
- 800-1,200 vehicles per hour per lane on uninterrupted four-lane roads
- Up to 1,600 vehicles per hour per lane on some expressways.

*Direction of traffic can also be easily estimated where necessary. For example, an apartment complex might add 1,000 trips a day to a nearby street. About 10%, or 100 trips, will occur during the evening rush hour. Of these 100 trips, about 35% or 35 trips will be outbound from the development. The rest, about 65 trips, will be heading toward the development.

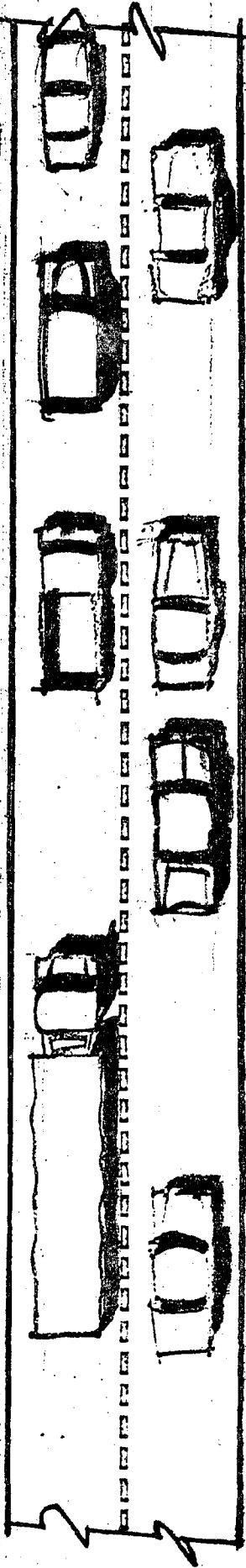
Table 2-6
LEVELS OF SERVICE

Level of Service	Description
A:	little traffic, no delays or speed reduction due to traffic, relatively free flow
B:	slight reduction in speed due to other cars on road
C:	satisfactory speeds, reasonably stable flow, speeds and maneuverability restricted by other cars, occasional minor delays
D:	occasional serious delays, little space for maneuvering, some cars may have to wait for signal to turn green twice before going through an intersection
E:	unstable flow; continuous backups at many intersections creating intolerable delays; hard for traffic to enter from cross streets
F:	very low speeds, cars backed up from one intersection to another; jammed

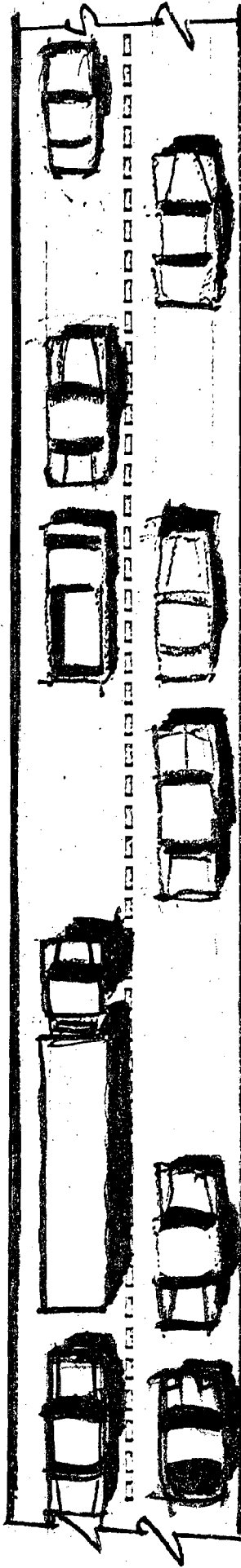
Source: Highway Research Board, Highway Capacity Manual, 1965.

FIGURE 3 Continued.

LEVEL D.



LEVEL E.



LEVEL F.

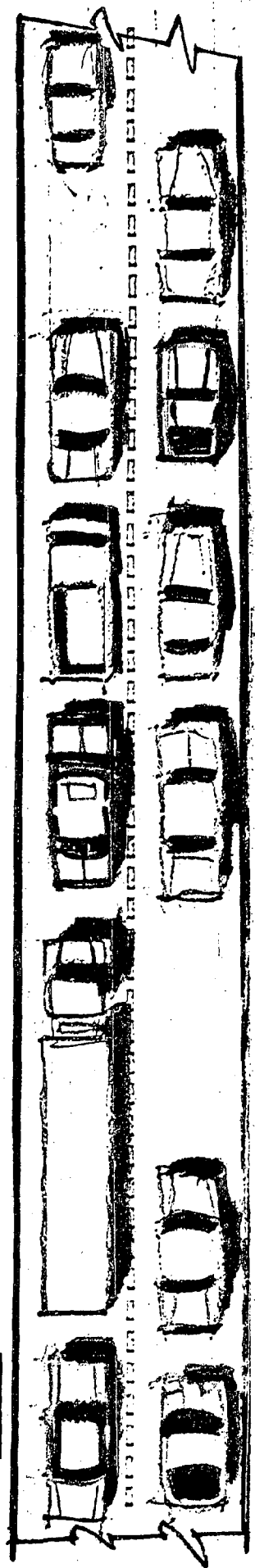
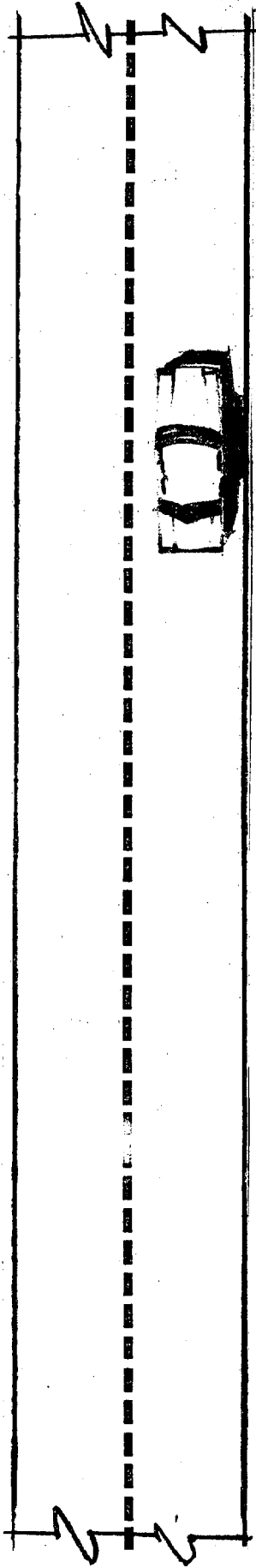
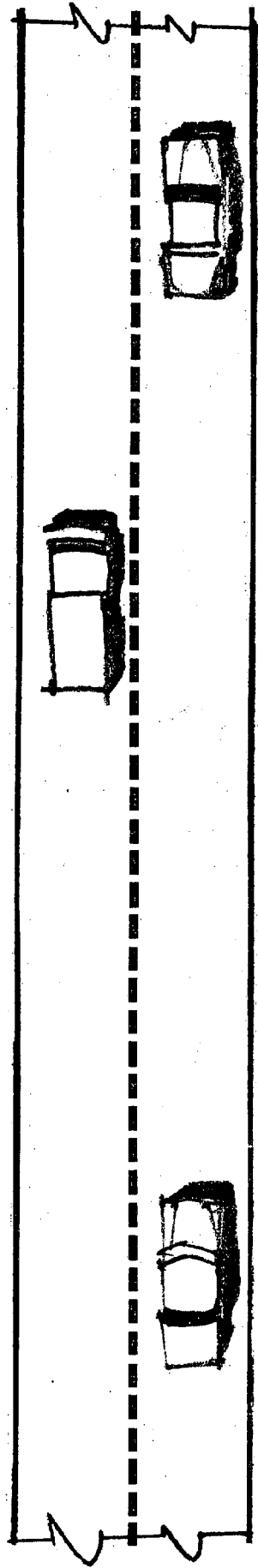


FIGURE 3 : LEVELS OF SERVICE.

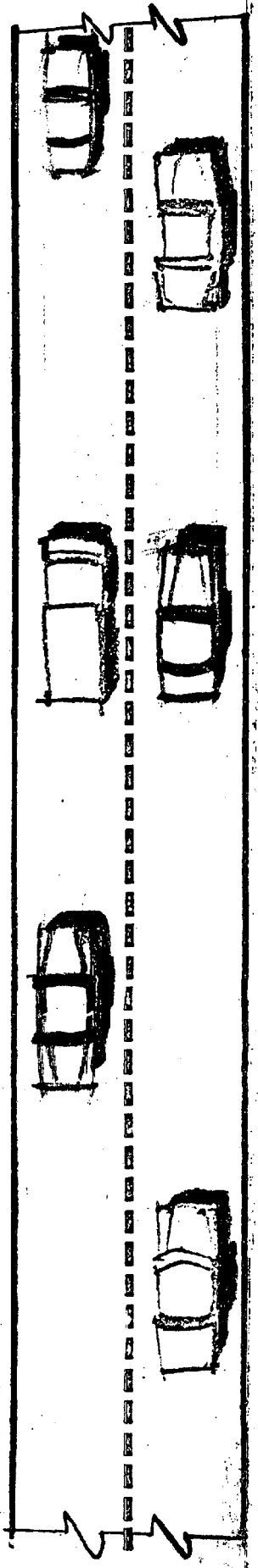
LEVEL A.



LEVEL B.



LEVEL C.



3.8 Estimate the Future Level of Service

If the level of service is now at level B or lower, each 15% increase in peak hour volume will result in approximately one step lower level of service. If service is now at level A, comparison with the volume/service level relationships given in the paragraph above may enable an estimate to be made.

3.9 Evaluation

Is service anticipated to be lower than Level C? Is level E or F expected? Deteriorating service can mean delays for drivers (or detours to avoid the congested street); air pollution from backed up cars; and a greater need for street improvements such as wider pavements, signals, one-way loops and no-parking regulations.

Officials who normally deal with traffic and traffic improvements in the community (e.g., selectmen, highway surveyor or superintendent, chief of local department of public works, police chief and/or traffic safety officer, representatives of the State D.P.W. area office) can help consider or review the scope of improvements that might be needed. Note that improvements and similar measures not only have financial costs, but other costs as well: trees cut down, front yards sliced off, retail sales reduced as parking and driving become more difficult, and greater public controversy.

To illustrate, suppose a two-lane road serving residential traffic now carries 12,000 vehicles per day. Peak hour is estimated to be 10% of that, or 1,200 vehicles (Step 3.3). Future development to be served by the street is estimated to add 300 vehicles per hour to that, for a non-proposal future peak hour of 1,500 vehicles (Step 3.4). A proposed 500-unit development served only by that street will generate 500 units x 8.5 trips/unit x 10% in peak hour, or addition of about 400 trips in the peak hour, bringing it to 1,900 vehicles (Step 3.5). This means a 25% increase in peak hour traffic without the proposal, a 60% increase in traffic with it (Step 3.6).

Current level of service is judged to be level "B", based on residents' consensus (Step 3.7). The 25% increase in traffic expected without the proposal will lower the level of service by 1+ steps ($25\% \div 15\%$) to level C or possibly to level D. The 60% increase in traffic expected with the proposal will lower the level of service 4 steps ($60\% \div 15\%$) or to level F (Step 3.8).

Actually, level F might not occur. Street capacity improvements might be made, or congestion might divert traffic onto other streets, or the traffic would be so bad, not all of the planned 500 dwellings would be built and occupied, or public transport might be provided.

4. QUALITY OF LIFE

Substantial traffic increases can affect the quality of life on nearby streets, even if there are no major safety or congestion problems. More cars mean more air pollution, noise, vibrations and traffic dangers; in some cases, the street may have to be widened or straightened. All these changes can make a residential street a much less pleasant place to live.

In reviewing proposals, the community should:

- a. Watch out for substantial increases in average daily traffic (e.g., more than 25% above what was expected on the street anyway).
- b. Also watch out for proposals likely to generate considerable truck traffic (factories, warehouses, truck terminals, regional shopping centers) in residential areas.
- c. Try to make sure that major traffic generators have egresses onto (or close to) major collector or arterial streets, rather than local residential streets.

5. REQUIRING ANALYSIS FOR SPECIAL PERMITS

Professional analysis is appropriate for proposals likely to have large or unclear impacts. In many cases, the developer of a major traffic generator can be required to submit a traffic analysis as part of a Special Permit application*. The community can require such an analysis in the following way.

5.1 Only Allow Major Traffic Generators on Special Permit

Table 2-7 suggests land uses likely to generate more than 250, 500, and 1,000 trips per day. The lower number may be an appropriate threshold for requiring special permits in small rural communities; the higher number may be appropriate in large communities.

5.2 Listing Traffic Criteria for Special Permit Approval

Possible criteria** are that major traffic generators should:

- a. provide at least 400 feet visibility in each travel direction***;

*Developers sometimes need such studies anyway, in order to design the final site plan for large developments and/or to apply to the State Department of Public Works for a curb cut on a state road.

**These criteria are illustrative and should be adjusted for any particular community.

***See page 44 for more detailed standards.

Table 2-7
MAJOR TRAFFIC GENERATORS

Land Use	Likely to have more than		
	250 trips per day	500 trips per day	1,000 trips per day
<u>Residential</u>			
Single-family homes	30+ du	60+ du	120+ du
Multi-family	40+ "	75+ "	150+ "
Mobile homes	40+ "	80+ "	160+ "
<u>Commercial</u>			
Shopping center	Any	Any	Any
Supermarket	Any	Any	Any
Car wash, gas station	Any	Some	--
Drive-in bank	Any	Any	Any
Other stores	5,000+ gsf	10,000+ gsf	20,000+ gsf
Fast food restaurant	Any	Any	Any
Other restaurants	1,500+ gsf	3,000+ gsf	6,000+ gsf
Hotel, motel with convention facilities	Any	50+ rooms	100+ rooms
Other motel	45+ rooms	90+ rooms	180+ rooms
<u>Industrial</u>			
Industrial (in general)	4+ acres	8+ acres	15+ acres
Manufacturing	100+ employees	200+ employees	400+ employees
Industrial Park	Any	Any	Any
Warehouse	50+ employees	100+ employees	200+ employees
Truck Terminal	Any	40,000+ gsf	80,000+ gsf
<u>Office</u>			
Office building	25,000+ gsf	50,000+ gsf	100,000+ gsf
Medical office building	Any	10,000+ "	20,000+ "

Table 2-7 (cont.)

Land Use	Likely to have more than		
	250 trips per day	500 trips per day	1,000 trips per day
<u>Institutional</u>			
General hospital	Any	Any	70+ beds
Long-term care hospital	70+ beds	140+ beds	280+ beds
College	Any	210+ students	420+ students
Airport	Any	140+ acres	280+ acres
<u>Recreation</u>			
Stadium	250+ seats	500+ seats	1,000+ seats
Drive-in theater	Any	250+ spaces	500+ spaces
Golf course	Any	90+ acres	180+ acres
Marina	60+ berths	120+ berths	250+ berths
Ski area, skating rink, beach, movie theater	Any	Some	Some

gsf = gross square feet of building floor area

dw = dwelling unit

^aAlso research and development

Sources: Based on Table 2-1 data

Format based on Martha's Vineyard Commission, "Table of Regional Traffic Generators", October, 1975.

b. not have any street egress within 250 feet of either an intersecting street or an egress from a parking area serving 30 or more vehicles*;

c. not create or significantly worsen traffic safety problems on any street within $\frac{1}{2}$ mile;

d. not result in traffic above the level "C" service capacity of roads and intersections at any point within $\frac{1}{2}$ mile, using definitions and methods of estimation as outlined in the Highway Capacity Manual, 1965 or later editions;

e. not increase average daily traffic by more than 25% above current levels** on any street within $\frac{1}{2}$ mile;

f. not increase average daily truck traffic by more than 25% above current levels** on any street within $\frac{1}{2}$ mile;

g. provide access to an arterial or collector street via ways serving 10 or fewer single-family homes.

5.3 Require Submission of Professional Analysis

Analysis by a qualified traffic engineer can be required, including:

a. Calculations at critical locations to show compliance with the criteria.

b. A narrative statement describing any traffic safety problems that may result.

c. A narrative statement suggesting actions by the developer or the community that would be needed to provide compliance with the criteria.

6. PROFESSIONAL ANALYSIS FOR OTHER PROPOSALS

In some cases, a major traffic generator will be proposed but the community does not or cannot require a Special Permit. In such cases (e.g., a rezoning, a proposed public facility, etc.), public officials might want to roughly estimate possible impacts to see whether a professional analysis is needed. If they decide one is needed, the community could provide the analysis itself (staff or outside assistance) or request that those making the proposal provide a traffic analysis. Such analysis might be similar to that described for a Special Permit.

*See page 44 for more detailed standards.

**Or, above levels expected within 5 years.

CHAPTER 2A

TRAFFIC IMPACTS OF DRUM HILL REZONING

SUMMARY

We have taken a quick look at the traffic impacts of proposed commercial zoning near the Drum Hill rotary. Methods were those outlined in the "Traffic Impacts" chapter. Findings are not surprising. If a regional shopping center is built on the site, there will be serious, negative traffic impacts, as suggested in the Comprehensive Plan Update:

"Undoubtedly the strongest impact will be on traffic flow in the Drum Hill area and careful engineering and roadway improvements would be necessary."*

A regional shopping center would greatly increase traffic on nearby roads, several of which do not seem adequate to handle the extra traffic. It seems likely that severe congestion would result on Drum Hill rotary, Drum Hill Road, Westford Street (Lowell), and North Road (from the site to I-495). This means: major delays during evenings and Saturdays for all drivers using those roads (not just drivers going to the shopping center); drivers making detours to avoid those roads; or, major improvements to increase road capacity.

What would these improvements involve? We don't think town costs are a major issue, since of the nearby affected roads, the town is only responsible for Drum Hill Road**, and shopping center tax benefits should easily offset town costs there ("Fiscal Impacts of Drum Hill Rezoning"). Incremental improvements seem possible on North and Drum Hill Roads; these might include road widening, traffic signals at shopping center egresses, etc.

The most serious issue is probably the Route 3-Drum Hill rotary. The shopping center would roughly double the amount of traffic on the rotary. Without a detailed study, we can't dismiss the possibility that the rotary simply can't carry the loads to be imposed on it. If that happens, we don't know of any simple solutions. Total redesign, reconstruction and enlargement might be required, possibly in conjunction with a new Route 213. Rotary improvements are up to the State Department of Public Works, which also must approve the developer's curb cuts onto North Road.

*William Melia, "Comprehensive Plan Phase One", June, 1975.

**North Road and the rotary are state highways. Westford Street is a Lowell street.

The following town actions would be appropriate:

1. Before rezoning the area, the town should obtain a professional traffic analysis of the shopping center's effect on the rotary. Analysis might be provided by the D.P.W., the developer, or a private traffic engineer hired by the town.

2. The findings of this analysis should be reviewed with the state D.P.W. Key questions are how the D.P.W. might respond to the curb cut application and how they might deal with the rotary. Review may give a better sense of whether and when a shopping center could happen. Some possibilities may become clearer:

a. The state might require the developer to make major contributions for road improvements. This appears to be an emerging state policy and could effectively prevent development if construed to include rotary improvements.

b. If rotary improvements are not to be made, the shopping center might not be economically feasible. Severe congestion might deter shoppers from going to the center, reducing potential sales.

c. The shopping center might depend on construction of Route 213 (which could reduce some street traffic in the area and involve rebuilding of the rotary). This would put development a long way off, since Route 213 is far from certain to be built in the near future.

3. In considering rezoning, the town should decide whether such major developments should be allowed outright or only on Special Permit. Special Permit procedure would allow public review of the specific development proposal, provide a public hearing, and enable the town to impose conditions on the development.

4. Special Permit criteria already deal with traffic impacts, including "congestion, hazard, or substantial change in established neighborhood character". (Sec. 11.1.2, Chelmsford Zoning Bylaw). It is possible to make these criteria more precise and to require the developer to submit a professional traffic analysis demonstrating compliance (see "Traffic Impacts").

5. The town might consider a bylaw controlling curb cuts on town roads, roughly similar to D.P.W. control over state roads. Criteria might include safe egress, clearly defined (not continuous) driveways, distance from other driveways, and the developer's agreement to share in street improvements needed to make the egress safe.

Traffic impacts were estimated as follows. Estimates are based on the current road system and would change if Route 213 were built.

TRAFFIC FROM DEVELOPMENT

A regional shopping center as proposed at Drum Hill would involve an enormous amount of auto traffic. About 50,000 trips per day would begin or end there (Table 2A-1). This is very large compared to possible development under industrial zoning (5,000 trips per day) and current traffic on major roads (about 12,000 daily trips each on Drum Hill and North Roads).

Traffic Distribution

Table 2A-2 shows where shopping center traffic might come from. This is a rough guess based on the market area for the regional shopping center, population and income in surrounding towns, each town's distance from the site, and the location of streets and highways.

Traffic has then been estimated for each road near the site (Figure 4). Assumptions could be changed but main results would probably not be affected:

- a. the majority of shopping center traffic will use the rotary;
- b. a substantial share will use Westford Street in Lowell.

Traffic Increases at Critical Locations

Shopping center traffic was compared with the traffic otherwise expected on roads near the site and at some problem intersections in other parts of town (such as Central Square)*. Changes would be dramatic (Table 2A-3). Traffic could roughly double on North Road (from the site to I-495), Drum Hill rotary, Drum Hill Road, and Westford Street in Lowell. Substantial increases might also occur on Parkhurst**, Old Westford, and Graniteville Roads.

CONGESTION

Traffic increases will affect the "level of service" at critical locations. Levels of service are noticed by every driver, ranging from A, ideal flow, to F, major traffic jam; C is considered reasonably stable flow. To quickly guess the extent of future congestion due to the shopping center (Table 2A-4):

*Intersections identified as needing major improvements in the Area-wide T.O.P.I.C.S. Plan, 1972.

**Increasingly used as a bypass as rotary congestion worsens, according to the T.O.P.I.C.S. Plan.

Table 2A-1
AVERAGE DAILY TRAFFIC FROM DEVELOPMENT AT DRUM HILL

	Current Zoning	Proposed Zoning
Assumed development	Industrial Park	Regional Shopping Center
Assumed building floor area	550,000 s.f.	1,260,000 s.f.
Trips per 1,000 s.f. ^a	9.3	40
Total trips ^b	5,000	50,000

^aTraffic Impacts, Table 2-1.

^bRounded off to nearest 1,000.

Table 2A-2
GENERAL TRAFFIC DISTRIBUTION FOR SHOPPING CENTER

Street	Direction	% of Shopping Center Traffic	Towns Served
Route 3	north	9	Tyngsborough; possibly Groton (via Route 40) and Nashua
North Road	north	9	North Chelmsford, Lowell (via Princeton St.)
Westford Street	east	26	Lowell, Dracut
Route 3	south	26	Billerica, Lowell (via connector); 495 east to Tewksbury, possibly Andover, etc.
North Road (and Parkhurst Road)	south	23	Central and South Chelmsford; 495 west to Westford, possibly Littleton, etc.
Old Westford Road	west	7	West Chelmsford, Westford
TOTAL		100	

Herr Associates' estimates

FIGURE 4: SHOPPING CENTER TRAFFIC DISTRIBUTION.

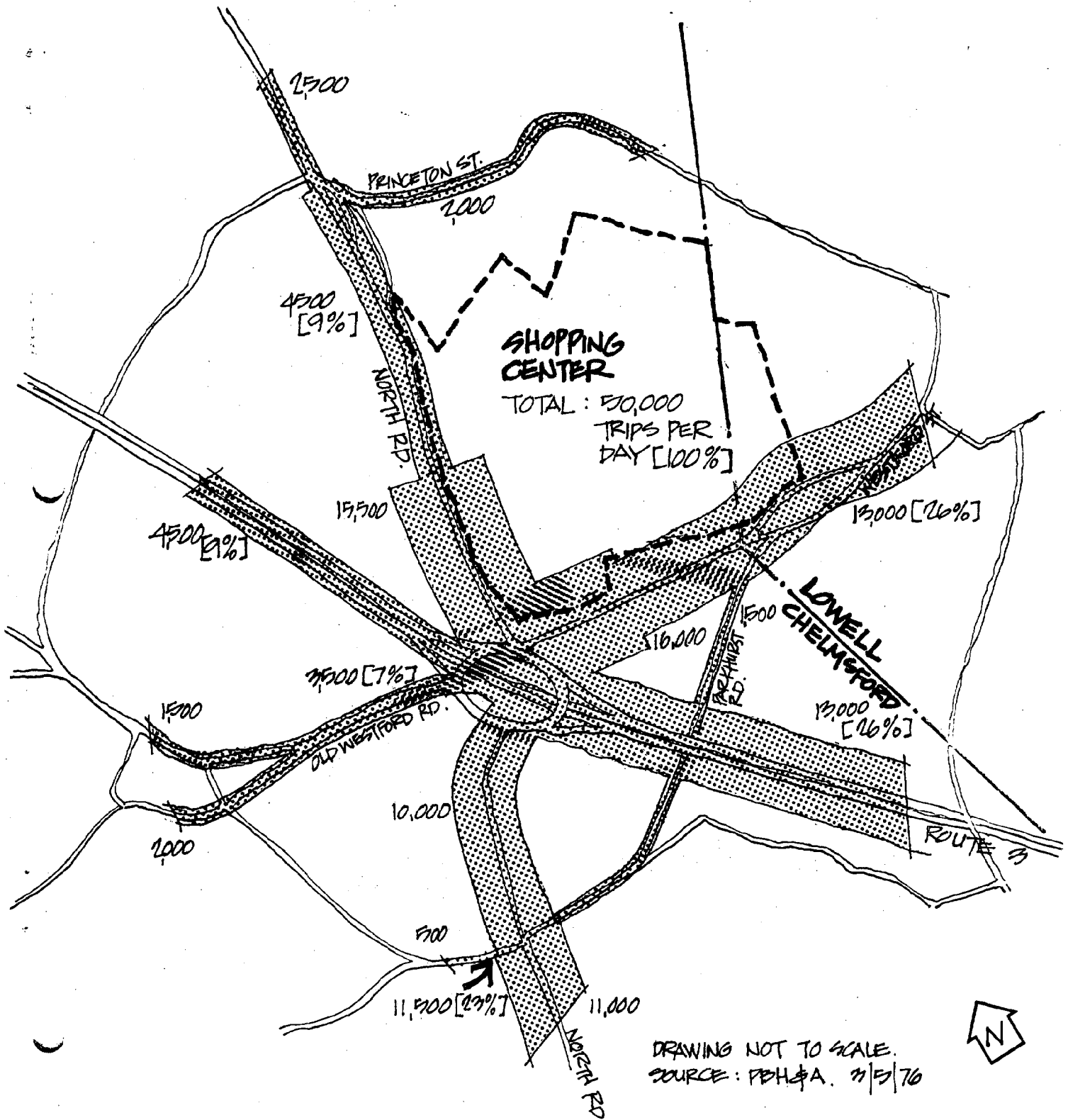


Table 2A-3
INCREASE IN DAILY TRAFFIC AT CRITICAL LOCATIONS

Figure 5 Reference	Street	Location	Traffic Expected Anyway ^a	Shopping Center Traffic	% Increase Due to Shopping Center
1	North Rd.	Groton Rd.	10,800	1,500	23
2	North Rd.	Princeton St.	13,200	4,500	34
3	North Rd.	just north of rotary	13,200	15,500	117
4	Drum Hill Rotary		35,000 ^b	31,500	90
5	North Rd.	just south of rotary	14,400	10,000	83
6	North Rd.	Dalton Rd.,	10,800	9,000	83
7	Central Square		34,000	5,500	16
8	Westford St.	Lowell	13,700 ^c	13,000	95
9	Drum Hill Rd.	just east of rotary	14,400	16,000	111
10	Old Westford Rd.	just west of rotary	10,800	3,500	32
11	Old Westford Rd.	Westford St.	6,000	1,500	25
12	Graniteville Rd.	School St.	4,800	1,200	25
13	Parkhurst Rd.		3,600	1,500	42

^a1972 traffic count (areawide T.O.P.I.C.S. Plan) plus assumed 20% increase by time shopping center is complete.

^bEstimate, based on streets entering rotary.

^cEstimate of 1978 traffic in U.S. Department of Transportation and Mass. Department of Public Works, Draft Environmental Impact Statement, State Route 213, 1975.

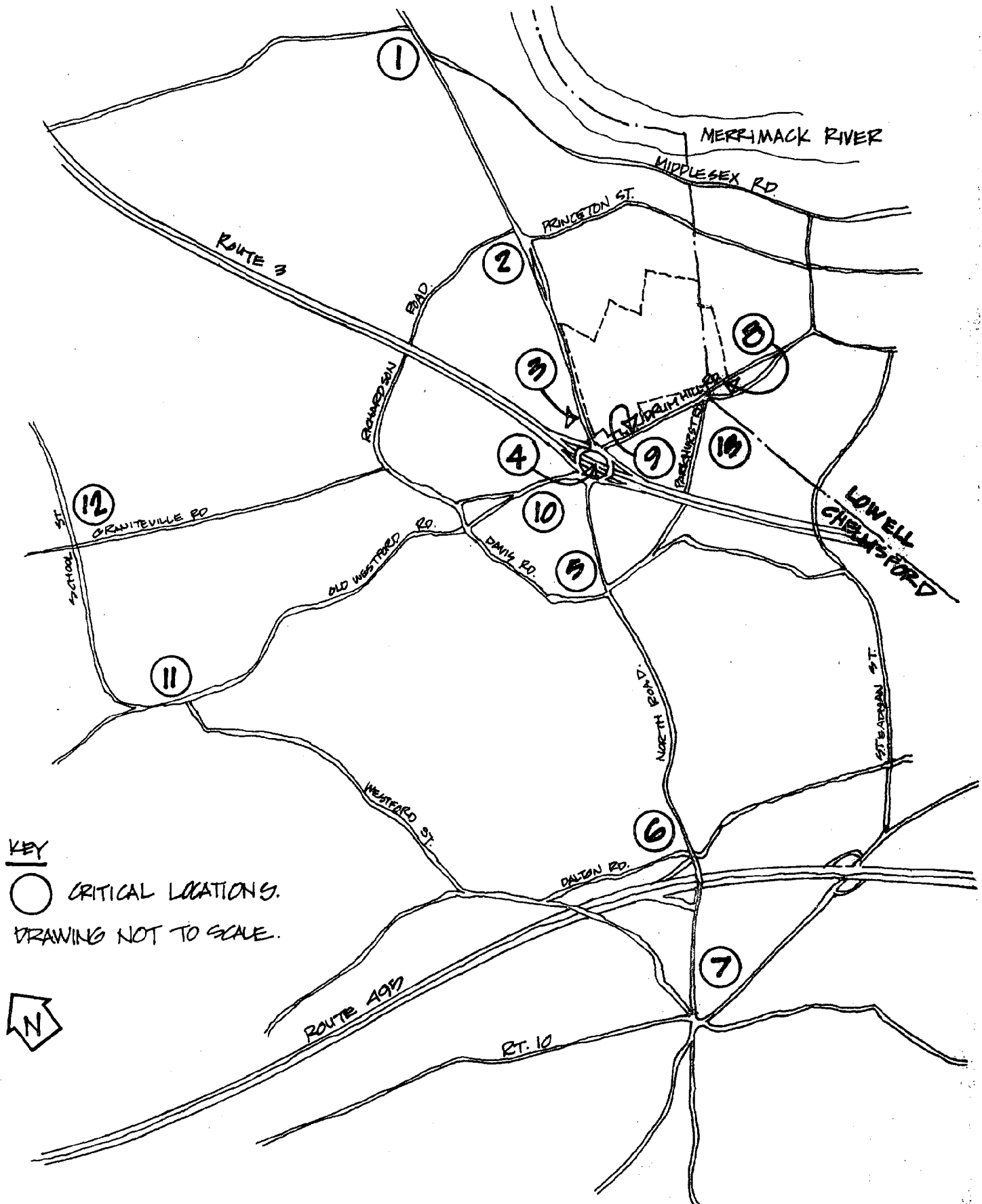
Table 2A-4

POSSIBLE FUTURE CONGESTION AT CRITICAL LOCATIONS

Figure 5 Reference	Street	Location	Est. Current Level of Service ^a	% Traffic Increase Due to Shopping Center ^b	Est. Future Level of Service ^c
1	North Rd.	Groton Rd.	C	23	D
2	North Rd.	Princeton St.	A	34	not worse than C
3	North Rd.	just north of rotary	B	117	F
4	Drum Hill Rotary		D	90	F
5	North Rd.	just south of rotary	C	83	F
6	North Rd.	Dalton Rd., I-495	C	83	F
7	Central Square		D	16	E
8	Westford St.	Lowell	C	96	F
9	Drum Hill Rd.	just east of rotary	D	111	F
10	Old Westford Rd.	just west of rotary	A	32	not worse than C
11	Old Westford Rd.	Westford St.	A	25	not worse than C
12	Graniteville Rd.	School St.	A	25	not worse than C
13	Parkhurst Rd.		B	42	D

^aPlanning Board estimates at evening rush hour^bTable 2A-3^cAssumes that if service is now B, each 15% traffic increase means one worse level of service. Also assumes no street improvements.

FIGURE 5 : CRITICAL LOCATIONS.



a. Planning Board members were asked to describe the current level of service during the evening rush hour (using descriptions and illustrations in the "Traffic Impacts" chapter).

b. It was assumed that evening rush hour traffic would increase by about the same percentage as daily traffic.

c. As a rule of thumb, if service is now at level B or worse, each 15% traffic increase probably means one worse level of service.*

d. This provides a rough guide to the future level of service at critical locations unless improvements are made. Serious problems are certain to occur where future service is estimated as "F".

SAFETY

Shopping center traffic may create safety problems in a number of ways:

1. Substantial traffic increases. The extra traffic will increase the danger of accidents throughout the Drum Hill area, simply by virtue of more cars being on the roads.

2. Increases at hazardous locations. Some of the largest traffic increases will occur where there are already safety problems (Table 2A-5). Shopping center traffic will certainly make these situations worse.

3. Driveway locations. Dangers mentioned above are largely inevitable if a regional shopping center is built on the site. Driveway location and design can create additional problems, some of which are relatively easy to modify. Quick review of the developer's preliminary site plan** (the proposed egresses from the Center are shown in Figure 6) raises the following concerns:

a. Distance from existing driveways and intersections. The Drum Hill Road egress ("B") is only 250 feet from the beginning of the rotary, and only 100 feet from an existing driveway. Turning conflicts could be reduced by setting the driveway further back from the rotary (say, 600 ft.).

b. Number of driveways. In addition to the mall complex, the developer is also planning a number of small commercial buildings along North and Drum Hill Roads (in areas already zoned for commerce). Each of these buildings would have a separate driveway, some very close to the main egresses for the mall (especially "B")

*See "Traffic Impacts".

**Derwood Quade, "Proposed Site Development Plan for the Mall at Drum Hill Road and North Road", prepared for General Growth Properties, March 26, 1975.

Table 2A-5
TRAFFIC INCREASES AT HAZARDOUS LOCATIONS

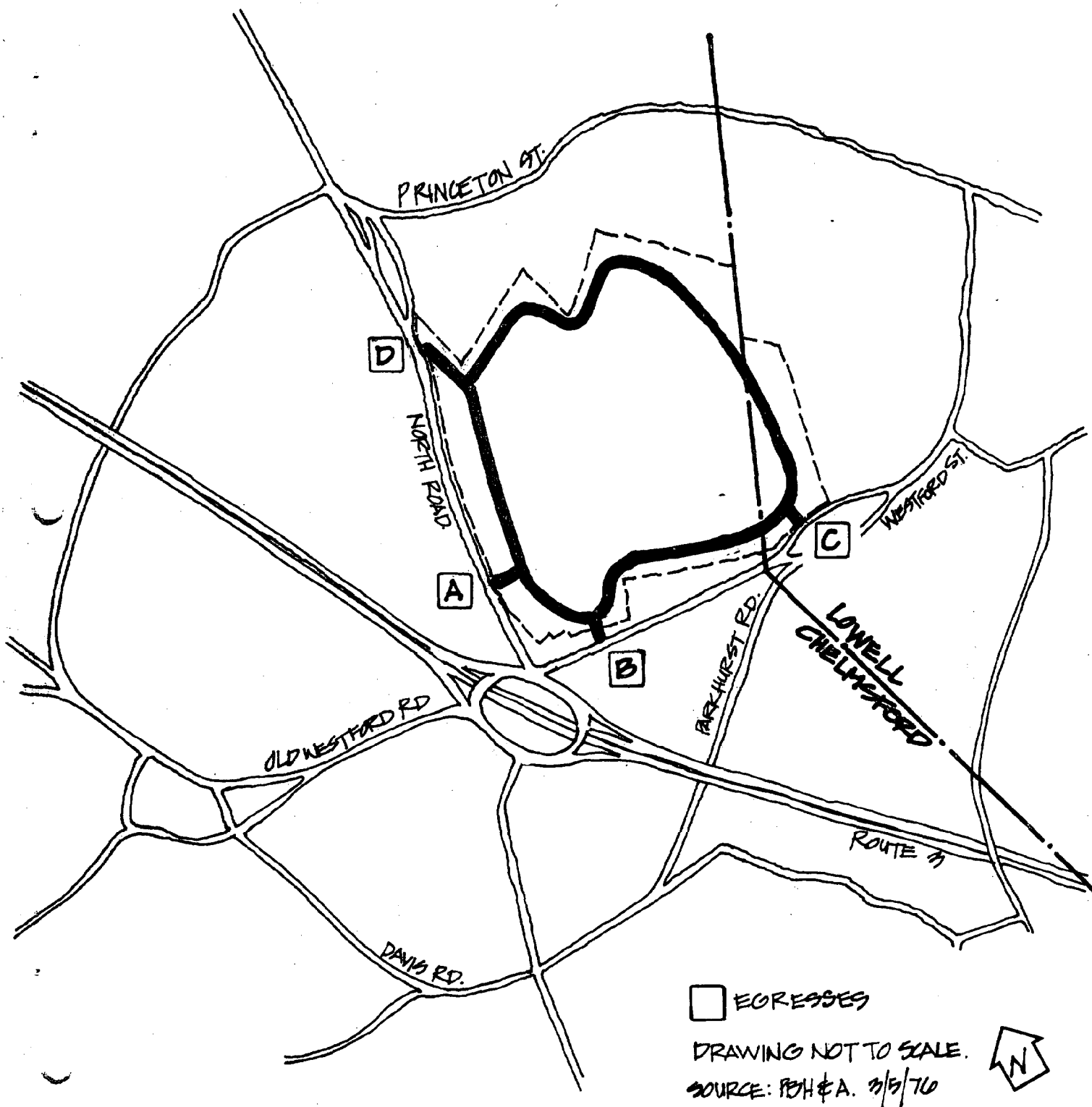
Figure 5 Reference	Street	Location	% Traffic Increase Due to Shopping Center	# Accidents in 1970 ^a	Problems Identified by T.O.P.I.C.S. Plan
1	North Rd.	Groton Rd.	23	8	Poor sight distances, skewed approaches
2	North Rd.	Princeton St.	34	4	Inadequate channelization and traffic signal
4	Drum Hill rotary		90	45	Weaving traffic; short weaving areas
5	North Rd.	just south of rotary	83	5 ^b	At Parkhurst Road, inadequate traffic controls
6	North Rd.	Dalton Rd., I-495	83	10	Blind curve on North Rd., off-set approaches of Dalton Rd.
7	Central Square		16	25	Inadequate channelization and curb radii
9	Drum Hill Rd.	just east of rotary	111		frequent driveways
11	Old Westford Rd.	Westford St.	25	5	Poor sight distance, vertical curve, tight curb radii
12	Graniteville Rd.	School St.	42	6	Poor visibility, tight curb radii
13	Parkhurst Rd.		42		See location 5 above

^aAccidents reported with over \$200 property damage

^bAt Parkhurst Rd.-Davis Rd. intersection

Source: Accident numbers and problems from Areawide T.O.P.I.C.S. Plan

FIGURE 6: SHOPPING CENTER EGRESSES (From Preliminary Site Plan).



and "D"). Driveways should either be separated by a greater distance (say, 250 or 500 feet) or, better, combined so that all buildings are served by the major mall egresses and access road.

c. Turning movements. The egress in Lowell ("C") may create complex and conflicting traffic movements, from Carl to Westford Street and possibly to Parkhurst Road. Professional analysis may be needed to determine a satisfactory traffic pattern at this location.

In addition, there will be heavy left turn movements at Drum Hill Road ("B", from rotary into development) and North Road ("A", from development out to rotary). An immediate solution isn't obvious*.

QUALITY OF LIFE

The shopping center is well-located to avoid major traffic increases on local, minor residential streets. It fronts on two of the town's most heavily used streets and provides almost direct access to an expressway.

However, the traffic increases, congestion, and safety problems will affect the quality of life of many residents. Examples:

a. Until (and unless) improvements are made, major traffic back-ups will affect people driving on such streets as North Road.

b. People who live on such streets as North Road, Old Westford Road, and Graniteville Road (and children who go to school there) will have to tolerate more noise, vibrations, pollution. Children and other pedestrians will have to be more cautious when using the street.

c. The shopping center will involve a large number of truck trips, many more than an industrial park would.

*A one-way pattern, in at North Road and out at Drum Hill Road, might make congestion even worse on a key section of the rotary.

Table 2A-6
TRUCK TRIPS

	Current Zoning	Proposed Zoning
Total Daily Trips	5,000	50,000
Truck Trips		
% of total ^a	3%	5%
# per day	150	2,500

^aBased on Louis Keefer, "Urban Travel Patterns for Airports, Shopping Centers and Industrial Plants", Highway Research Board, 1966.

d. Shopping center traffic may accelerate the need for intersection improvements which have social and environmental costs, such as property taking or the removal of trees and foliage.

Some of these effects are hard to measure but are nevertheless important in considering the traffic impacts of major commercial development on the site*.

*Another potential concern is adequacy of parking spaces. We don't foresee this as a problem at the shopping center. The site plan provides 5.5 spaces per 1,000 sq. ft. floor area, a standard recommended by the Urban Land Institute and estimated by them to accommodate all parking except during the 10 peak shopping hours each year: J. Ross McKeever, Shopping Center Zoning, Urban Land Institute, 1973. The Comprehensive Plan suggested 5 spaces per 1,000 sq. ft. (Sec. 7.5.1 Proposed Zoning Bylaw, 1975). Chelmsford now requires 10 spaces per 1,000 sq. ft. plus 1 space per 2 employees (Sec. 6.3.1 Chelmsford Zoning Bylaw), much higher than many current standards.

CHAPTER 3

FISCAL IMPACTS

Fiscal effects of development are often a major concern. How will the proposal affect the local tax rate: will taxes from the development pay for the added police, fire, school and other services? Where a development requires major public improvements, another question may also be important: what will be the effect on the community's debt and its ability to borrow money for other needed improvements? This chapter suggests methods for answering these questions.

It should be recognized that the fiscal consequences of development depend heavily upon the fiscal system dictated by state law. Increasingly, state aid and fiscal law is aimed at equalizing tax burdens among municipalities, which means reducing the fiscal significance of "tax profitable" or "tax deficit" development. It seems likely that the future will see this trend continue. This could mean serious disappointment for the community which accepted otherwise undesirable development for tax gain that was later legislated away, or for the community which denied otherwise desirable development because of presumed tax deficit that future legislation could offset.

This uncertainty has important implications:

- predictions are perilous; note that methods and findings in this chapter are based on the current state-local fiscal system;
- fiscal impacts should not monopolize study effort and attention; other issues may deserve more detailed study;
- decisions on development proposals should not be based primarily on fiscal considerations, which are hard to forecast and may be transitory.

Decisions based solely on fiscal considerations also raise ethical problems. Carried to an extreme, such decision-making results in social exclusion, identification of all children as liabilities, and distortion of patterns of economic growth.

Key Aspects of Development

Community review of development proposals should usually focus on the following aspects of development which often have the largest fiscal consequences.

Residential v. Non-Residential. Commercial and industrial developments pay school taxes but do not directly add school children. They are usually fiscally profitable. Residential development is usually not as profitable; it is often subsidized by commercial and industrial uses.

Number of School Children. More children per dwelling unit means higher school costs and worse fiscal impact. This is usually the single biggest influence on fiscal balance of residential development. Number of children depends largely on the housing type and, especially, on the number of bedrooms per unit.

Multi-Family Tenure. Depending on local assessment practices, condominiums may pay considerably more in taxes than do similar rental units.

Seasonal Occupancy. Seasonally occupied units do not have school costs and cost less for other public services. They are much more profitable than year-round units. Be careful, however. Many "second" homes eventually become first homes.

Major Public Improvements. Developments which precipitate major increases in the capacity of public facilities (a new well, sewage treatment plant, school, etc.) can be unusually costly and affect the community's debt ratio and borrowing ability.

Phasing of Development. The phasing of the development can have a critical effect on the timing of required public improvements and on the community's ability to extend its services and facilities in a gradual and planned manner.

Special Tax Arrangements. Developments "taxed" under Ch. 121A pay much less to the community than conventional developments, but don't diminish state school aid in the way conventionally assessed developments do.

Internal Services. Large developments may provide many of their own services (such as security guards, recreation facilities, water supply), reducing the public service costs.

Suggestions for Fiscal Studies

Fiscal studies deal with many factors and often raise questions about what should and should not be counted. The following general suggestions may be useful*.

Focus on Change in the Tax Rate. This is where property owners will feel the real fiscal effect of the development. Estimate the change from the current local tax rate if the proposal had already been approved, built, occupied and paying taxes**.

*See also Thomas Muller, Fiscal Impacts of Land Development, A Critique of Methods and Review of Issues, Washington, D.C.: Urban Institute, 1975.

**Normal assumptions are that (a) inflation can be ignored because the development's revenues would increase just as its costs do; and (b) the development is a net addition to the community; even if the residents and shops occupying it come from elsewhere in town, it is assumed outsiders will move in to replace them.

Count Both Costs and Revenues. A developer may only point out the new revenues his development will provide. Opponents may only point out the new school that will be needed. Both elements should be taken into account.

Be Consistent in the Portion of Costs and Revenues Analyzed. Normally, analysis should be confined to those costs funded by property taxes, excluding those paid by excise taxes, revenue sharing, state aid, etc., and comparing those costs with revenues derived from property taxes. Change in level of state school aid should also normally be analyzed, especially in the case of development involving few or no school children, since the level of that aid is often strongly affected and is highly significant to the tax rate.

Make Rough Estimates. Precise calculations are rarely worth the effort, since the basic assumptions of fiscal analysis are quite crude. Local spending and tax rates, for example, change every year. Public services, by their nature, serve the entire community, so trying to identify the costs a particular development will add is at best an approximation.

Use Average Costs. Assume that new development has the same average costs (per pupil, per dwelling) as present development in the community. (Exception: where major public improvements are required, compute debt service attributable to the new development). Rather than use average costs, one could try to figure out, item-by-item, all the marginal costs due to a development. Such an approach is very time-consuming, however, requires many assumptions, may not add much accuracy, and, in fact, often greatly underestimates the eventual costs of serving the development.

Treat School Costs Separately. They are the single largest item in local budgets, are easy to distinguish, and vary enormously by land use.

In Most Cases, Treat All Other Costs as a Single Item. There are many other public services, each of which makes up a relatively small fraction of total costs. Local costs of each function are hard to identify separately. Therefore, line-by-line analysis of the local budget* is probably only worth the extra effort where a very large development is proposed.

*For examples of a line-by-line approach, see Adams, Howard and Opperman, "Comprehensive Development Plan, Town of Lincoln", 1965; Brookline Planning Department, "Residential Cost-Revenue Analysis", July, 1973; and Susan Levine Houston, "The Costs and Revenues Generated by Low and Moderate Income Housing in the Suburbs: A Study of Newton", unpublished Master of City Planning Thesis, MIT, 1972.

Compare the Proposal to Alternative Development. What will happen on the site if the proposal is rejected? If other new development is likely, estimate the tax rate change it would cause*. If no alternative development is likely (say within 5 or 10 years), this step can safely be ignored.

Steps in Fiscal Analysis

The following steps are involved in estimating the tax impact of new development.

1. Estimate revenues;
2. Estimate school costs;
3. Estimate non-school costs;
4. Estimate change in state school aid;
5. Estimate average year debt service of major public improvements (if relevant);
6. Compute potential change in current tax rate;
7. Adjust for secondary impacts of development (if any).

These steps are outlined below. For steps 3 and 4, separate methods are shown for residential development (3A, 4A) and for non-residential development (3B, 4B).

STEP 1. ESTIMATE REVENUES

Revenues are equal to the total tax rate times the assessed value of the property.

Revenues = Assessed Value (in \$1,000's) x Total Tax Rate

*Tax rate change if the proposal is approved and if it is rejected can be weighted by probability of development in each case (e.g., 40% chance, 80% chance).

1.1 Estimate Assessed Value Per Unit

Realistically estimate the assessment per dwelling unit or per square foot of building floor area. Approaches: obtain a ballpark figure from the assessor based on the type and quality of development; check assessments of similar recent projects; or estimate the market value (from the developer or similar projects) and adjust it by the equalization ratio for your community*.

1.2 Determine Assessed Value of Proposed Development

Multiply the assessment per unit by the number of units proposed (e.g., estimated \$30,000 valuation per dwelling unit x 200 dwelling units = \$6,000,000 assessed valuation).

1.3 Estimate Property Tax Revenues

Multiply the assessed value of the development in \$1,000's by the total tax rate. The current total tax rate can be obtained from the assessors (it is printed on your tax bill).

Sample calculations are shown below:

Est. Assessed Value (per dwelling per sq.ft.)	\$ 30,000
x # of units proposed	200
= Assessed value of development	\$6,000,000
÷ 1,000	1,000
= Assessed value of development in \$1,000's	\$ 6,000
x Total Tax Rate	42.00
= EST. PROPERTY TAX REVENUES	\$ 250,000 ^a

^arounded off

*This is the ratio of assessed value in the community to the equalized ("full market") value estimated by the State Tax Commission. The ratio reflects under-assessment in each community but should be used cautiously for any particular development. A community's assessed and equalized valuations can be obtained from the assessor or the Bureau of Local Assessment, Department of Corporations and Taxation. An example:

assessed value of community	\$28,000,000
÷ equalized value of community	\$33,000,000
= equalization ratio	0.85
x estimated market value of unit	\$ 35,000
= estimated assessed value of unit	\$ 30,000

Equalization ratios are also listed directly in the Massachusetts Taxpayers Foundation, "Municipal Financial Data: Including 1976 Tax Rates" (updated annually). This publication also contains other useful data for fiscal analysis.

A different approach is needed where property taxes are set as a percentage of rent. Many communities tax apartments and commercial properties at a certain percentage of the rent, usually between 15% and 25%. Revenues can be estimated in these cases by:

a. Finding out what percentage is normally used (and whether it is applied to the total rent roll) by checking with the assessor or looking at tax payments and rents of other projects.

b. Multiplying the percentage by the expected annual rent (developer's estimate or competitive projects):

Tax Percentage x Annual Rent = Est. Property Tax Revenues

STEP 2. ESTIMATE SCHOOL COSTS

This step only applies to year-round dwellings. School costs are often the largest costs for residences and are estimated as follows.

2.1 Determine Total Local Cost of Education

The school tax levy is the total school cost (including capital costs) supported from local property taxes (after state aid and other offsetting revenues)*. The school tax levy (or "school assessment") can be obtained from the assessor**.

2.2 Compute Average Cost Per Pupil

Divide the school tax levy by total public school enrollment (from the school department)***. This indicates the current average cost per pupil. We assume that new pupils will cost the same as present pupils, although in particular instances they may cost either more or less.

*Do not use other figures (e.g., total school budget) since they may reflect non-property tax revenues.

**Or computed:

School tax levy = Community's assessed valuation (in \$1,000's)
x School Tax Rate (printed on your tax bill).

***Enrollment should be for the same year as the school tax levy. It should include any pupils from the community who attend regional schools, but exclude private school pupils. If you use state-furnished or other standardized data, be sure what it includes.

2.3 Estimate Number of Pupils Per Unit in Proposed Development

The number of pupils varies dramatically by type and age of dwelling (See Table 3-1, based in part on a very extensive Rutgers University study*). Don't use the current community average. If the proposal is similar to recent developments in the community, a survey might be valuable (door-to-door or from school department records). Otherwise, the following may be used:

a. Estimate pupils per dwelling unit based on the type of development. Table 3-2 shows common differences between single-family homes and several kinds of apartments.

b. If you know the number of bedrooms, you can make a more accurate estimate (See Table 3-3).

c. Adjust the estimate for any particular characteristics of the development (elderly housing, etc.).

d. Adjust the estimate for particular characteristics of the community. The great range in number of children from single-family homes (Table 3-2) reflects these differences between communities. To get a better local estimate for new homes, we often assume that brand-new homes average one and one-half times the number of children from existing homes in the community**.

2.4 Determine School Cost Per Proposed Dwelling Unit

This is simply the average cost per pupil (from 2.2) times the number of pupils per unit (from 2.3). For example:

\$940 per pupil x 1.2 pupils per unit = \$1,130 school cost per unit

Where the proposal includes several types of units (e.g., studios and 2-bedrooms; townhouses and garden apartments) estimate the average cost per unit for each type.

*George Sternlieb and Robert Burchell, "The Numbers Game: Forecasting Household Size", Urban Land, January, 1974.

**Thus, for communities which are mostly single-family:

Est. Pupils Per New 1-Family Home =

$$1.5 \times \frac{\text{Current Total Enrollment}}{\text{Number of dwelling units in community}}$$

See page 75 for estimating number of dwellings. This difference between new and old homes is a rough rule of thumb but is consistent with household size data in the 1970 U.S. Census of Housing, "Components of Inventory Change, Boston S.M.S.A."

Table 3-1
NUMBER OF PUPILS PER UNIT: IMPORTANT FACTORS

Factor	Effect
Age of dwelling	New single-family homes have more children than old single-family homes (children grow up and leave). Age has no clear effect on apartment occupant distribution.
Type of dwelling	Single-family homes have more children than apartments (have more bedrooms, appeal to larger families). Apartments have special appeal to retired persons, childless couples, young couples with pre-school children.
Number of bedrooms	The more bedrooms, the more children. This is often the single most important factor.
Specialized type of development	Second homes: no children. Retirement communities, elderly housing, singles complexes: few children. Low-income family housing: more children than average.
Price of unit	Much less important than number of bedrooms. Rutgers study found that: expensive homes and high-rise apartments have more children, expensive garden apartments have fewer.
Characteristics of community	Role of community: e.g., bedroom suburb has more children per unit, college town has fewer. Public school reputation: may attract families with more children. Strong parochial schools: may reduce public school enrollments.

Source: Herr Associates; Sternlieb and Burchell, "The Numbers Game"

Table 3-2
TYPICAL NUMBER OF PUPILS PER NEW DWELLING UNIT

Type of Dwelling	Rutgers Study	Common Range
High-rise apartment	.07	.03 - .15
Garden apartment	.16	.10 - .30
Townhouse apartment or condominium	.51	.35 - 1.00
Single-family home	.90	.90 - 2.00

Table 3-3
NUMBER OF PUPILS PER UNIT, BY BEDROOMS

Type of Dwelling	Number of Bedrooms	Number of Pupils Per Unit	
		Rutgers Study	Range of Other Studies ^a
High-Rise Apartments	0 (studio)	.00	--
	1	.01	.05
	2	.18	.13
	3	--	.32
Garden Apartments	1	.05	.01 - .10
	2	.34	.23 - .42
	3	--	.84 - 1.03
Townhouses	2	.22	.26
	3	.67	.44 - .94
	4	1.03	.90 - 2.10
Single-Family Homes	2	--	.20
	3	.63	.50 - 1.40
	4	1.29	1.63 - 2.02
	5	--	2.19 - 2.63
	6	--	2.60

^aIllinois School Consulting Service, reported in Michael Levin, "Cost-Revenue Impact Analysis: State of the Art", Urban Land, June, 1975; studies by Robert Burchell, Barton-Aschman Associates, Paul Holley, and Monmouth County, N.J. Planning Board summarized in Rutgers Study.

2.5- Determine Total School Costs for Proposed Development

Multiply the average cost per dwelling unit by the number of units proposed (e.g., \$1,130 per unit x 200 units = \$226,000 school costs).

Where the proposal includes several types of units (e.g., studios, 2-bedrooms; single-family and apartments), first estimate the costs for each set of units (e.g., \$600 per 1-bedroom unit x 10 1-bedroom units = \$6,000; \$1,200 per 2-bedroom unit x 20 2-bedroom units = \$24,000). Then sum all the costs (e.g., \$6,000 + \$24,000 = \$30,000).

Sample calculations are shown below:

School tax levy	\$770,800	
÷ Current enrollment	820	pupils
= Average cost per pupil	\$ 940	/pupil
x Est. pupils per proposed dwelling unit	1.2	pupils
= School cost per proposed dwelling unit ^a	\$ 1,130	
x Number of proposed units ^a	200	
= SCHOOL COST OF PROPOSED DEVELOPMENT	\$230,000 ^b	

^aThis can be calculated for an average unit in the development, or can be calculated separately for each type of unit and then added.
^brounded off.

STEP 3A. ESTIMATE NON-SCHOOL COSTS FOR RESIDENTIAL DEVELOPMENT

The following method can be used to quickly estimate all non-school costs (police, fire, roads, general government) to service proposed residential development. We assume that each new dwelling will cost the same as the average dwelling in the community.

3A.1 Determine Total Non-School Costs in Community

The community's total non-school cost is its general tax levy (property tax levy less school tax levy). This can be obtained from the assessor*.

*or computed:

General Tax Levy = Community Assessed Valuation (in \$1,000's)
x General Tax Rate

The general tax rate is printed on your tax bill along with the school tax rate and the total tax rate, which combines the two.

3A.2 Determine Residential Non-School Costs

Only some public services go to residences. One can often assume that the residential share of costs is simply the residential share of property values. Total assessments by category of land use are now available from either the local assessors or the Bureau of Local Assessment, Department of Corporations and Taxation. Thus, total residential costs might be estimated:

Total Residential Non-School Costs = General Tax Levy x

$$\frac{\text{Residential Assessed Valuation}}{\text{Total Assessed Valuation}}$$

Assessed valuations are not always the best way of splitting costs. If there is a nuclear power plant in the community, it may use a small share of public services but make up a very large share of assessments. Costs can be split instead in relation to each land use's share of the community's developed acreage (from a recent land use survey) or share of employment (State Division of Employment Security) plus population (1975 State Census). An item by item split of costs can also be made, but the effort is seldom justified by increase in accuracy.

3A.3 Estimate Non-School Costs Per Year-Round Dwelling Unit

Divide the total residential costs by the number of dwellings in the community to find the average cost per unit.

The total number of dwellings may be listed in a recent Master Plan or estimated by the regional planning agency. If not, one can use 1970 U.S. Census data and building permit records to estimate the current number of dwelling units in the community. The following steps are involved.

a. Find number of dwelling units for which building permits were issued between 1970 and the year preceding the year whose costs are being analyzed. Building permit information can be obtained from the building inspector or the Office of Code Development, Massachusetts Department of Community Affairs.

b. Multiply the number of permits issued by 95%, to reflect the fact that some permits were never used*.

c. Add the number of units built since 1970 (from "b") to the number of units listed in the 1970 U.S. Census of Housing**.

*Also subtract permits that were issued but never used for a large development. Other adjustments are possible (demolitions, conversions, etc.), but probably not worthwhile since the whole fiscal analysis is quite general anyway.

**U.S. Bureau of the Census, 1970 U.S. Census of Housing; Volume I Housing Characteristics for States, Cities and Counties; Part 23 Massachusetts.

Another approach is to determine the number of occupied units. If the Building Inspector keeps tabs on the number of occupancy permits, the number issued since 1970 can be added to the number of occupied units in the 1970 U.S. Census of Housing.

Adjustments are needed if the community now contains a large number of seasonal units*.

3A.4 Estimate Non-School Costs for Proposed Year-Round Dwellings

Multiply the average cost per year-round dwelling by the proposed number of such units. If the development only contains year-round units, STOP. Sample calculations are shown below.

General Tax Levy	\$410,000
x % Residential (e.g., residential ÷ total assessed valuation in community)	75%
= Residential Non-School Costs	\$307,500
÷ Number of dwelling units in community	770 units
= Average cost per year-round dwelling unit	\$ 400/unit
x Number of year-round dwellings proposed	200 units
= NON-SCHOOL COST OF PROPOSED YEAR-ROUND DWELLINGS	\$ 80,000

3A.5 Adjust for Seasonal Dwellings (If Proposed)

The following steps can be used to consider seasonal dwellings.

a. Estimate average cost per seasonal unit. This may be about $\frac{1}{2}$ the cost per year-round unit. Occupants may only be in the community $\frac{1}{4}$ of the year and thus make smaller demands on roads, libraries, sewers. However, they usually add to the peak period

*Seasonal units generally cost less to service. If they cost $\frac{1}{2}$ as much as year-round units, calculate costs per "equivalent" year-round unit in the community as follows:

Non-School Cost per Year-Round Equivalent Unit =

$$\frac{\text{Residential Non-School Costs for Community}}{\# \text{ of Year-Round Units} + \frac{1}{2} \times \# \text{ of Seasonal Units}}$$

The 1970 U.S. Census of Housing lists seasonal units in two categories: "Vacant - Seasonal and Migratory" and "Vacant - Held for Occasional Use". Remaining units are considered available for year-round use. Note: seasonal housing in towns on Cape Cod is currently being estimated by the Cape Cod Planning and Economic Development Commission.

demand for which roads and utilities are designed and require some police and fire protection during the rest of the year. If year-round units cost \$400 each, we usually assume that seasonal units cost \$200 each. If feasible, adjust this fraction up or down depending on local experience.

b. Estimate costs for all proposed seasonal units. Multiply the average cost by the number of seasonal units proposed.

c. Add costs of seasonal units to costs of year-round units to find the total non-school costs of the development.

STEP 3B. ESTIMATE NON-SCHOOL COSTS FOR NON-RESIDENTIAL DEVELOPMENT

Costs of new commercial and industrial development can also be estimated in terms of average unit costs. The non-residential share of the general tax levy can be estimated and then determined per acre, per employee, per \$1,000 valuation. But the results are much less reliable than residential cost estimates since commercial and industrial development includes such an enormous variety of land uses.

Another approach might be to estimate a range of costs based on the non-school taxes paid by the development. At a maximum, commercial and industrial uses probably do not cost more to service than they pay in such taxes*. (Some of the services, e.g., libraries, recreation primarily serve residents). Some detailed cost studies have implied that the non-school costs of such uses average about 25% of their non-school revenues (Lincoln), 65% (Ashland), and 60% (downtown Boston)**. Therefore, one might estimate a range of non-school costs:

Non-School Costs = (say .30 to .70) x Assessed Value of Development
x General Tax Rate

Percentages can be adjusted for the type of development. Percentages might be very low for power plants but quite high for downtown shops which add to peak traffic and parking demands and require public police and fire protection.

*Unless they precipitate major public improvements. Note: even if they only "break even" on non-school costs and revenues, commercial and industrial uses can still be very profitable, since they pay school taxes but have no school costs.

**Lincoln Master Plan; Herr Associates "Revenue Analysis" for Ashland Finance Committee, revised December 11, 1972; and Boston Municipal Research Bureau and Abt Associates, The Effect of High Density Development on Municipal Finances in the City of Boston, Boston, 1974. The ratio was 90% for one Boston area, an old industrial section with low property values.

For major proposals it may be worthwhile to try to estimate the new development's share of a few large cost items in the community. For example, traffic from a new shopping center might equal 25% of current traffic in the community. It could be roughly assumed that its highway costs would be about 25% of the current highway budget (from annual report, less state aid for highways). This could be done for the largest non-school items in the community (frequently highways, police and fire) to estimate a minimum cost for the development. Total non-school revenues from the development might suggest a maximum figure.

STEP 4A. ESTIMATE CHANGE IN SCHOOL AID DUE TO YEAR-ROUND RESIDENTIAL DEVELOPMENT

New development can affect the Chapter 70 state school aid formula, and thus the amount of school aid the community receives*. Each community is reimbursed by the state for a certain share of school costs: from a minimum of 15% to a maximum of 75%. The community's aid percentage depends on its (equalized) assessments and number of school children. New development with high assessments and few children (e.g., luxury units, studio apartments) will usually decrease the community's aid percentage. This means less state aid for all pupils in the community. Low-cost units with many children will usually increase the community's aid percentage. This means more state aid for all pupils in the community.

A proposal's effect on the school aid percentage is sometimes very significant and should be estimated. Be careful. Pupils from the new development, of course, will receive some state aid. That is not an extra cost or revenue due to the development; it is already reflected in the local cost of education (step 2.2) and should not be separately counted.

Calculating the effect of new development on school aid is risky, since the formula may well change in the next few years. However, the program itself seems sure to stay and to provide more aid each year. The formula, despite possible changes, is likely to remain tied to property values per school child. The following steps are a short cut, approximating change in the complex official formula. They are appropriate for residential developments which are large or differ considerably from the community norm.

*Development can also affect the level of lottery aid received by the community, but the effect is usually quite small.

4A.1 Find Out the Community's Current School Aid Percentage

This can be obtained from the State Department of Education*. Don't calculate school aid change if the aid percentage is now 15% or 75%; the community is already at (or beyond) the limits of the formula; new development will probably not have any effect.

4A.2 Estimate % Increase in Enrollments Due to Proposal

Divide the proposal enrollment by the community's current enrollment. For example, there are now 820 pupils in the town. The proposal will add 200 pupils, or about 25%.

4A.3 Estimate % Increase in Assessments Due to Proposal

Divide the assessed value of the development* by the current assessed value of the community. For example, assessments might go up by \$6 million, a 21% increase over the town's \$28 million assessed value.

4A.4 Determine Net Difference Due to Proposal

Subtract the assessment increase (4A.3) from the enrollment increase (4A.2). If the outcome is positive, state aid will go up. If it is negative, state aid will go down. If assessments and enrollments go up at the same rate, there won't be any change in state aid. If enrollment goes up 25% and assessments 21%, the net difference is +4%.

4A.5 Determine % Gain or Loss in School Aid

Multiply the difference calculated at step 4A.4 by the appropriate multiplier in Table 3-4. This indicates the percentage gain (or loss) in school aid. The right-hand column shows the maximum loss possible. To continue the example, say the aid percentage is now 40%; multiply +4% by 1.5 (from Table 3-4), indicating a 6% gain in aid.

*The Research, Planning and Evaluation Division publishes each community's school aid percentage in "Analysis of School Aid to Massachusetts Cities and Towns, Chapter 70 Amended".

**If revenues were estimated directly (page 70), assessed value of the proposal can be computed:

$$\text{Assessed value of development (in \$1,000's)} = \frac{\text{Revenues}}{\text{Total Tax Rate}}$$

Table 3-4
SCHOOL AID CHANGE

Present Aid Percentage ^a	Multiplier	Maximum % loss in School Aid
20%	4.0	25%
25	3.0	40
30	2.3	50
35	1.9	57
40	1.5	62
45	1.2	67
50	1.0	70
55	0.8	73
60	0.7	75
65	0.5	77
70	0.4	79

^aDon't calculate if the community's school aid percentage is now 15% or 75%.

4A.6 Find Out How Much Aid the Community Would Otherwise Receive

Find out how much aid the community now receives (from the assessors or the Planning and Research Bureau, Department of Corporations and Taxation) and increase it to reflect the % increase in enrollments (from 4A.2). Say school aid is now \$510,000 plus 25% increase for new pupils, or an anticipated total of \$640,000.

4A.7 Estimate Change in School Aid Due to Proposal

Multiply the % gain or loss (from 4A.5) by the total amount of aid (from 4A.6). In our sample case, a 6% gain times \$640,000 means a net gain for the community of \$38,000 a year as a result of change in the school aid percentage.

If the residential development doesn't require major public improvements, go directly to step 6 (page 83).

4B. ESTIMATE SCHOOL AID CHANGE DUE TO NON-RESIDENTIAL DEVELOPMENT

This procedure applies to commercial and industrial proposals and also to residential proposals which have only seasonally-occupied units (and therefore have no school-enrolled children). Such proposals add assessments but not school children. They can substantially reduce Chapter 70 state school aid. A shopping center in Chelmsford, for example, might reduce that town's Chapter 70 aid by \$200,000 a year. The reduction in aid can be estimated as follows (see 4A for additional details).

4B.1 Find Out the Community's Current School Aid Percentage

This is available from the Research, Planning and Evaluation Division, State Department of Education. If the aid percentage is now 15%, STOP: no further calculations are needed; the proposal will have no effect on state school aid.

4B.2 Estimate % Increase in Assessments Due to Proposal

Divide the assessed value of the development by the current assessed value of the community.

4B.3 Determine % Loss in School Aid

Multiply the % increase in assessments by the appropriate multiplier in Table 3-4. The result is the percentage loss in school aid due to the development. Check the right-hand column of the table for the maximum loss possible.

4B.4 Find Out How Much Aid the Community Now Receives

This can be obtained from the assessors or the Planning and Research Bureau, Department of Corporations and Taxation.

4B.5 Estimate School Aid Loss Due to Proposal

Multiply the % loss by the current amount of aid. For example:

Assessed Value of Development	\$ 10,000,000
÷ Current assessed value of community	100,000,000
= % increase in assessed value	10%
x Multiplier from Table 3-4	1.5 ^a
= % loss in school aid	15%
x Current school aid	\$ 2,000,000
= EST. LOSS IN SCHOOL AID	\$ 300,000

^aif aid percentage is now 40%

5. ESTIMATE COSTS FOR MAJOR PUBLIC IMPROVEMENTS (where relevant)

Cost estimates made to this point assume that proposed development will have the same average costs (both operating and capital) as existing development in the community. A few proposals, however, impose costs far above the current community average by precipitating certain major public improvements. In these cases, extra debt service due to the development should be counted as an additional cost. The following steps are involved.

5.1 Determine What Improvements Are Involved

First, determine if the development will precipitate any major public improvements. See Chapter 2 on Traffic Impacts and Chapter 4 on Public Facility Impacts. Check with relevant local agencies, and perhaps with design professionals.

Second, if improvements are required, will they push the proposal's costs far above the current community average? This is likely where the improvements:

- would not otherwise be built in the foreseeable future;
- would substantially increase the community's current annual debt service*; and
- would go beyond the type and scale of improvements now being paid for by the community (e.g., a new school in a town which hasn't built a school in 20 years, the establishment of a public sewerage system, etc.).

If the improvement meets all the above, calculate added debt service due to the proposal as follows.

5.2 Estimate Municipal Cost of the Improvements

Municipal cost is the total cost less state or federal aid less any contributions by the developer. The specific local agency or design professionals can help estimate costs.

5.3 Determine Municipal Cost Due to the Proposal

What share of the cost is just for serving the development? Most new facilities serve other users as well.

5.4 Calculate Average Year Debt Service Due to the Proposal

The additional principal and interest payments in an average year** are computed as follows:

$$\text{Average Year Debt Service} = \frac{\text{Principal}}{\text{Repayment Period}} + \frac{\text{Principal}}{2} \times \text{Interest Rate}$$

(Interest rates now seem to be fluctuating around 7%).

*Quickly estimate annual debt service for the improvement (say 10% of the municipal cost estimated in Step 5.2). Compare this to the community's current annual principal and interest payments on all improvements (from the community's annual report or capital improvements plan). Would the community's debt service increase substantially?

**The average year (when half the principal has been paid off) provides a long-term estimate of the extra costs.

Note on Bonded Indebtedness. Major public improvements can also affect the community's bonded indebtedness. Will the improvements make it difficult for the municipality (or a public service district) to borrow money for other needed facilities? Local officials who normally deal with bonding and planning capital improvements might:

- a. Estimate costs of the required improvements (Steps 5.1 and 5.2 above).
- b. Schedule the improvements.
- c. Estimate what the principal and interest payments would be each year; estimate what the outstanding debt would be.
- d. Compare these figures with what is already being planned (e.g., in an ongoing capital improvements program).
- e. Determine if the total level of borrowing would be likely to impair the community's credit rating and increase interest costs. (Some common suggestions are keeping net debt less than 10% of equalized valuations, and keeping annual debt service less than 15% of the property tax levy).

STEP 6. COMPUTE CHANGE IN THE TAX RATE

The proposal's potential effect on the tax rate is estimated as follows:

6.1 Determine Annual Fiscal Gain or Loss

Add up all the costs and revenues from the development. The result is the annual fiscal gain (or loss) due to the proposal.

6.2 Calculate Tax Rate Change

Divide the annual fiscal gain or loss by the combined assessed value of the community and the proposal*.

If this number is positive (revenues greater than costs), it shows how much the tax rate would be reduced. If negative (revenues less than costs), the tax rate would rise by that amount. Table 3-5 shows a format for estimating tax rate change.

*Where revenues were estimated directly for rental properties (page 70), assessed value can be quickly determined:

Assessed value of development (in \$1,000's) = $\frac{\text{Revenues}}{\text{Total Tax Rate}}$

Table 3-5

SAMPLE FORMAT: TAX RATE CHANGE DUE TO DEVELOPMENT

Revenues from development	\$250,000
- School costs	- 230,000
- Non-school costs	- 80,000
+ Change in state aid	+ 40,000
- Average year debt service for public improvements (if any required)	<u>0</u>
= Total annual fiscal gain or loss	- 20,000
÷ Assessed value of community plus develop- ment (in \$1,000's)	<u>34,000</u>
= EST. CHANGE IN TAX RATE*	\$ 0.60 increase

*Where annual fiscal gain, this is the potential reduction in the tax rate; where annual fiscal loss, this is the potential rise in the tax rate.

For residential developments, it may be valuable to work out a table or chart which shows tax rate change for different kinds of units. Instead of going through the analysis each time a development is proposed, one could look up the result for each proposal's average assessed value and school children per unit. Following is a possible format.

EFFECT OF A 100-UNIT DEVELOPMENT ON THE (1972) BOURNE TAX RATE

Average Assessed Value Per Dwelling Unit	Seasonal	Type of Dwelling		
		Year-Round		
		# of children per unit		
		0	1	2
\$10,000	+\$0.04	+\$0.23	+\$0.65	+\$1.04
\$20,000	- 0.13	+ 0.08	+ 0.47	+ 0.88
\$30,000	- 0.26	- 0.07	+ 0.30	+ 0.71
\$40,000	- 0.43	- 0.24	+ 0.14	+ 0.54
\$50,000	- 0.57	- 0.39	- 0.02	+ 0.38
\$60,000	- 0.71	- 0.53	- 0.17	+ 0.22
Assessed valuation per unit needed to "break even"	\$12,500	\$25,000	\$49,000	\$74,000

Based on Herr Associates, Guide to the Fiscal Impact of Development, Bourne Planning Board, revised September 17, 1974.

STEP 7. CONSIDER SECONDARY IMPACTS OF PROPOSED DEVELOPMENT

These effects are often small and elusive. They are usually not worth detailed study. For some proposals, however, indirect costs and revenues are significant and should be included in estimating the tax rate change (Step 6).

7.1 Nearby Property Values

Effects of a proposal on surrounding property values are hard to predict, may only reflect a transfer in land values from another part of the community, may not show up in re-assessments for years, and in the long run may just promote more intensive development with its own service costs. The effect may be relatively clear and significant in some cases, however. Local officials and merchants might agree, for example, that a department store proposed for a stagnating downtown would stimulate sales of other businesses and push up property values.

Additional tax revenues can be estimated in such a situation:

- a. Divide the area around the proposal into a few zones, using a copy of the assessor's map.
- b. For each zone, add up the current taxes on all properties (from the assessors' commitment sheets).
- c. Multiply the current taxes by a reasonable percentage change for each zone; closer zones will usually show larger changes.

7.2 Spur to Other Development

The likelihood that a major proposal will lead to other development in the community is worth considering. A subsidiary activity, for example, might later be built right by the development, e.g., a gas station next to a shopping center. A major employer in a rural area may increase housing demand by attracting workers to the region; some may settle in the community*.

In such cases, secondary costs and revenues due to the initial proposal can be estimated:

- a. Guess the type and amount of secondary development.
- b. Estimate costs and revenues.
- c. Multiply these by the increased probability that the secondary development will be built in the community (e.g., .60 chance within 5 years if initial proposal is approved minus .20 chance if proposal is rejected).

7.3 Size of Community

As communities grow, their expenditure levels and tax rates change. A major residential development can thus have a long-term effect on community costs simply by increasing the population. We roughly estimate that for Massachusetts communities under 50,000, each 1,000 extra people might add a half dollar to the local tax rate. The effect is therefore quite small for most new developments**.

*Some secondary fiscal impacts are usually not very significant. Shopping centers, for example, have little effect on local housing demand, since they don't usually attract employees from outside the region. Major new employers in metropolitan communities probably have little effect on housing since most workers will probably commute; there may be little in-migration. New housing does lead to retail development, but the stores may be built outside the community and the extra tax revenues may be quite small (often less than \$30 per new dwelling).

**1,000 people means about 300 single-family homes or 400 apartments.

Higher tax rates in large communities may reflect added public functions (e.g., public sanitation), the substitution of professional employees (firemen, administrators) for volunteers, and extra layers of administration.

In any event, the most important implications of increased community size may not be on the local tax rate but on the shift in demand among public services, the style and structure of local government, and the opportunities, diversity and social character of the community.

CHAPTER 3A

FISCAL IMPACTS OF DRUM HILL REZONING

SUMMARY

We have estimated the effects of proposed commercial zoning near Drum Hill rotary, using methods outlined in the "Fiscal Impacts" chapter. General findings are as follows:

1. Industrial development (under present zoning) and commercial development (proposed zoning) are both fiscally "profitable" for the town. Either would pay more in taxes than it would cost to service, potentially lowering the tax rate.

2. If commercial zoning leads to development of a very large regional shopping center*, Chelmsford's tax rate might be reduced by about \$1.00 (Table 3A-1).

3. Such development is far from certain. Rezoning could result in a smaller amount of development, or even in none. As a result, the "expected value" of tax reduction within 5 years is considerably less than the maximum possible, perhaps half or \$0.50.

4. Industrial development would have considerably lower fiscal benefits, and seems less likely to be realized in the near future than commercial development on the site.

5. Commercial zoning would therefore have a net fiscal benefit to the town, though not nearly as much as the \$3.00 tax rate reduction mentioned in the Comprehensive Plan Update**. Our estimates are lower because we have (a) estimated somewhat lower assessments, (b) deducted for town costs, and (c) considered effects on state school aid. Further refinements are possible but probably would not change the general magnitude of results very much.

6. Estimates are based on the current state aid formula. The formula may change but probably not enough to wipe out the tax benefits of the shopping center.

*Such as the "ultimate" center proposed by General Growth Development ("Importance of the Mall to the Community", 1975). The smaller the center, the less the effect. The "initial" stage proposed for the site would be about 2/3 the size, and have 2/3 the fiscal benefits, of the ultimate center.

**William Melia, "Comprehensive Plan, Phase One", June, 1975.

Table 3A-1
ESTIMATED TAX RATE CHANGE

	Current Zoning	Proposed Zoning
Possible type of development	Industrial Park	Regional shopping center
Possible reduction in tax rate	\$0.26-0.39	\$0.88-1.23
Probability of full development within 5 years	15%	50%
"Expected value" of reduction in tax rate (rounded off)	\$0.05	\$0.45-0.60

7. The fiscal benefits of rezoning could be significant. A \$1.00 tax rate reduction means that if your house is assessed at \$30,000, you might save about \$30 a year. Tax benefits may not be overwhelming, however. Other impacts, notably traffic, may be as or more compelling.

Tax rate change was estimated in the following way.

REVENUES

Revenues are equal to the town's tax rate times the assessed value of the development as shown in Table 3A-2. Assessments can easily be estimated since the assessors value manufacturing space at \$8.00 a sq. ft. and commercial space (such as the recent Chelmsford Mall) at \$12.00 a sq. ft. The estimated \$15 million assessment on the shopping center is smaller than the \$20 million mentioned in the Comprehensive Plan but larger than the \$13 million estimated by the developer.

Our revenue estimates differ from the developer's ("Importance of the Mall to the Community") in a number of ways. We have:

- included non-leasable as well as leasable area, since it is also assessed;
- excluded buildings not affected by the rezoning: in Lowell or on property already commercially zoned;
- assumed \$12 a sq. ft. assessed value, not \$10 a sq. ft.
- only counted assessment of buildings, not land;
- used the fiscal 1976 tax rate;

Table 3A-2
REVENUES

	Current Zoning	Proposed Zoning
Floor area	550,000 s.f.	1,260,000 s.f.
x Assessed value per sq.ft. ^a	\$8.00	\$12.00
= Est. assessed value	\$4,400,000	\$15,120,000
x Chelmsford tax rate ^b	\$41.50 per \$1,000 of assessed value	
= PROPERTY TAX REVENUES	\$183,000 ^c	\$628,000 ^c

^aChelmsford assessor's office

^bFiscal 1976 total tax rate

^cAll revenues and costs in the analysis are rounded off to the nearest \$1,000.

- counted local property tax revenues, not state sales tax or inventory tax.

NOTE: The shopping center revenues reflect distribution of buildings on the preliminary site plan. Since the property straddles the Lowell border, fiscal benefits might be considerably smaller if more of the buildings were located on the Lowell part of the site.

SCHOOL COSTS

None, under current or proposed zoning.

NON-SCHOOL COSTS

Commercial and industrial development does impose some town service costs: e.g., for fire protection, police protection, police traffic duties, highway maintenance, inspections, hearings, other administrative functions. We don't know of a simple and reliable way to assign these costs to a particular development. Instead, we have assumed that non-school costs are a certain percentage of non-school revenues from the development. We have used a wide range, from 30% to 70%, reflecting findings of earlier studies. Estimates are shown in Table 3A-3.

Other assumptions could be made, but final conclusions aren't very sensitive to this factor. The low estimate, for example, suggests commercial zoning would probably reduce the tax rate by about \$0.65. The high cost estimate (which is more than twice as high) only changes this to \$0.45 (Table 3A-1).

Table 3A-3
NON-SCHOOL COSTS

	Current Zoning		Proposed Zoning	
Assessed value	\$4,400,000		\$15,120,000	
x General Tax Rate (non-school tax rate)	\$16.42 per \$1,000 of assessed value			
= Non-school revenues	\$72,000		\$248,000	
	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>
x Costs as % of revenues	30%	70%	30%	70%
= EST. NON-SCHOOL COSTS	\$22,000	\$55,000	\$74,000	\$174,000

STATE SCHOOL AID

Any new development will change the amount of Chapter 70 school aid the town receives. New commercial or industrial development adds to the tax base, but doesn't add any school children. Under the present Ch. 70, this extra value per child means less state aid.

Table 3A-4 shows the loss in state aid from development on the site. Note that these amounts are very substantial, and are the single largest cost of development.

MAJOR PUBLIC IMPROVEMENTS

Street Improvements

A regional shopping center could double traffic on nearby roads. Major street improvements might be needed to deal with increased congestion. The town is responsible for improvements on Drum Hill Road (North Road and the rotary are state highways). As a quick estimate, we've assumed the town might have to spend \$150,000*, perhaps including:

- \$25,000 for a signal at the egress on Drum Hill Road;
- \$80,000 for improvements and possible widening along Drum Hill Road (1,600 feet x \$50 per linear foot);

*In practice, the town may use Chapter 90 state highway aid for Drum Hill Road improvements. However, the town gets a limited amount of money from the state each year. State aid used at Drum Hill means less aid at other locations in the town. The town's net costs therefore aren't affected by Ch. 90 arrangements at the site.

Table 3A-4
STATE SCHOOL AID LOSS

	Current Zoning	Proposed Zoning
Assessed value of development	\$4,400,000	\$15,120,000
+ Current assessed value of community ^a	\$265,864,000	\$265,864,000
= % increase in assessed value	1.7%	5.7%
x Multiplier from Table 3-4, "Fiscal Impacts" ^b	1.0	1.0
= % loss in school aid	1.7%	5.7%
x Current school aid ^c	\$3,375,000	\$3,375,000
= EST. LOSS IN SCHOOL AID	\$57,000	\$192,000

^aReal plus personal property

^bCurrent school aid percentage is 50.6, say 50

^cFiscal 1976 Cherry Sheet

- \$45,000 for contingencies, such as land purchases and minor improvements along Parkhurst Road if needed.

This would not include \$70,000 worth of improvements already recommended for the area to serve existing traffic (better signs, pavement marking, flashing beacons, etc.)*.

If improvements cost \$150,000, have a 15 year life span, and a 7% interest rate, average year debt service might be \$15,000:

$$\begin{aligned}\text{Average Year Debt Service} &= \frac{\text{Principal}}{\text{Repayment Period}} + \frac{\text{Principal}}{2} \times \\ &\quad \text{Interest Rate} \\ &= \frac{\$150,000}{15} + \frac{\$150,000}{2} \times 0.07 \\ &= \$10,000 + \$5,250 \\ &= \$15,250 \\ &\text{say } \$15,000\end{aligned}$$

This is a relatively small number in the fiscal analysis. Review of the site plan by the Superintendent of Streets could improve its accuracy. However, even if costs were \$300,000, double what we've assumed, the tax rate reduction would only be about \$0.05 smaller (say, \$0.95 instead of \$1.00).

Industrial development does not seem likely to precipitate major street improvements; its daily traffic would be about 1/10 that of the shopping center.

Other Improvements

We don't foresee other major improvements likely to affect the town tax rate:

a. Water. The North District has its own financing system and charges customers for service. Development on the site may well aggravate problems and accelerate the timing of improvements**. We assume, though, that charges to the development can offset its share of improvement costs.

b. Sewerage. If a municipal system were established, taxes and/or fees would be assessed on properties. There is no reason to assume that development on this property won't pay its way.

*Areawide T.O.P.I.C.S. Plan, 1972.

**"Public Facility Impacts of Drum Hill Rezoning".

INDIRECT IMPACTS

Concern has been expressed that a regional shopping center will "capture" sales and as a result eventually reduce tax revenues from existing Chelmsford stores or future ones which would otherwise have been built. This will certainly happen to some extent. However, the loss is less than one might expect and may be roughly offset by increased sales at other stores in the Drum Hill area (see "Economic Impacts of Drum Hill Rezoning").

In terms of tax revenue, we have assumed that these effects balance out. Other assumptions are possible. In the worst possible case (no induced sales at Drum Hill), net tax benefits would be about 80% of those shown in Table 3A-1. A regional shopping center might then mean about a \$0.80 tax rate reduction instead of \$1.00.

Of course, the shift in sales may be a very important concern on non-fiscal grounds, such as the vitality of present commercial areas and the effect on current store owners.

CHANGE IN TAX RATE

Table 3A-5 shows how all these costs and revenues might affect the town tax rate. If an industrial park had already been built, this year's tax rate might have been reduced \$0.30 or \$0.40. A regional shopping center could have reduced the tax rate 3 times as much.

EXPECTED TAX RATE CHANGE

Zoning doesn't guarantee development. Tax rate change depends on site development, but development may not happen, may not happen for many years, or may not happen on the scale that we've described. Change expected in 5 years is based on assumptions about probability of development under current and proposed zoning (see Appendix to "Impact Summary: Drum Hill Rezoning"). Considering the probabilities of industrial and shopping center development, the "expected" tax rate change in five years is a reduction of \$0.05 if industrial zoning is retained, or about \$0.50 if rezoning to allow a shopping center is approved.

Table 3A-5
TAX RATE CHANGE, IF FULL DEVELOPMENT

	Current Zoning	Proposed Zoning
Revenues	\$183,000	\$628,000
- School Costs	0	0
- Non-School Costs	22,000-55,000	74,000-174,000
- State School Aid Loss	57,000	192,000
- Street Improvements (average year debt service)	0	15,000
= TOTAL-ANNUAL FISCAL GAIN	\$71,000-104,000	\$247,000-347,000
÷ Assessed Value of Community + Development (in \$1,000's)	\$270,000 ^a	\$281,000 ^b
= EST. TAX RATE REDUCTION	\$0.26-0.39	\$0.88-1.23

^a\$265,864(000) community + \$4,400(000) development

^b\$265,864(000) community + \$15,120(000) development

CHAPTER 4

PUBLIC FACILITY IMPACTS

This chapter deals with impacts on major public facilities, such as the need for a new school or wellfield. Street improvements are dealt with separately (Traffic Impacts chapter). Normal agency operations (personnel, assignments) are dealt with in this guidebook in the way that they are reflected in the tax rate (Fiscal Impacts chapter).

New development normally increases pressure on public facilities. The proposal may substantially increase water use, sewage flows, storm water runoff, number of school children. Where the new demand passes or brings nearer a "break point", major capital improvements may be required. Sometimes, expanding demand is not responded to by expanding facilities, but in that case, too, a price is paid: more crowded facilities, less efficient operations, reduced services, perhaps higher insurance rates (e.g., fire insurance). Thus, it is possible to speak about potential demand resulting from growth, whether responded to by construction or not.

Following are common concerns about new development.

1. Will the development require (immediately or eventually) a type of public service not now provided in the area (such as public water, public sewerage)?
2. Will development overload capacity of existing facilities, or make it hard to accommodate other expected growth?
3. Will major capital improvements be needed, such as additions, extensions, new facilities?
4. Some of the improvements may be needed or already planned regardless of the development. Will the proposal accelerate their timing or increase their scale (and cost)?
5. Are there likely to be serious time lags before the proposed development can be adequately serviced? This may suggest phasing the development.
6. Are there likely to be problems borrowing for the improvements? Large-scale borrowing may be difficult or impossible for small communities or service districts.
7. Will there be long-term fiscal effects? The development's share of debt service costs can be estimated. If the facility is provided by the municipal government, debt service can be compared with revenues (and other costs) from the development (see "Fiscal Impacts", p. 83).

As with other impacts, the facility consequences of the proposal should be compared with those of possible development if the proposal is rejected. Net difference may sometimes be slight, sometimes a question of which year the improvements will be needed.

Experts

In evaluating facility impacts, the impact analyst must depend upon a variety of experts. It is important to understand that "need" is not often objectively determinable, and that the expert's role naturally colors his perception of need. Beware: treat expert input with some skepticism. Some common role influences:

The elected or senior appointed facility manager: He will often minimize limitations of facilities he is responsible for, since doing otherwise reflects on the job he has been doing. Exception: the new manager of "inherited" facilities, which he'll often find grossly inadequate.

The professional facility designer: Engineers and architects generally use very conservative assumptions when evaluating facilities. This reflects both a general concern not to under-design facilities and also the general orientation (and self-interest) of the profession toward building newer, bigger and better facilities. If the professional designer finds a facility adequate, it probably really is. If he finds facilities inadequate and in need of expansion or replacement, it is often valuable to review his assumptions.

The national organization. Librarians, policemen, firemen, recreationists, and others all have their state, regional, or national standard-setting organizations. The dynamics of these organizations is clear: their "standards" are seldom "norms", really being "goals". That's fine if understood.

1. SCHOOL FACILITIES

To estimate impact on need for school facilities, the following steps are required.

a. Estimate enrollment from the development for selected future years, by grade grouping: elementary, junior high, senior high. In the fiscal impacts chapter, we outlined how to estimate total school enrollment resulting from development (pages 71-73). Allocating estimated enrollment among grade groupings is even more uncertainty-prone than the basic estimate. We do not find national or other local studies useful for this, but instead suggest allocating students to grade levels based on local experience. For example, suppose that a development is estimated to add 400 children to the schools when fully developed. If 60% of all current local enrollments are in grades K-6, a reasonable first approximation is that 60% of these 400 children will also be in grades K-6, or 240

children in those grades. Enrollment impact should be estimated for selected years based on the phasing schedule of the development (see page 143). The total enrollment figure will only be reached when the development is fully occupied.

b. Allocate those enrollments to existing or committed future facilities, based on school district lines. For example, the proposed project might be served by two school districts. Half of the students, or 120, might be allocated to each.

c. Estimate future enrollment in the affected schools each year, ignoring the proposed development. The school department may already have made a detailed projection. The Bureau of Research and Assessment, Mass. Department of Education, has made projections by grade groupings for each school system in the state*. Upon request they will project enrollments by district within the school system; simply provide them with district enrollments by grade for the last 10 years.

d. Add enrollment each year from the proposed development to that expected anyway. For example:

Year	Projected District School Enrollment Without Development	Projected Enrollment From Development	Total
1977	640	30	670
1978	650	60	710
1979	640	90	730
1980	630	120	750
1985	580	120	700
1990	580	120	700

e. Evaluate the results. Does the total ever exceed current levels? Given falling birth rates, it might not. Does it ever exceed the School Department's suggested capacity for the school? If so, by how much, and for how long? If overcapacity results, can it be resolved by redistricting, or will more heroic efforts be required, such as double sessions or a new building or building addition?

2. RECREATION FACILITIES

In assessing consequences of residential development on recreation facilities, the following should be considered:

a. Determine what facilities the development itself is going to provide. Many, especially clustered developments, internally provide facilities completely satisfying some recreational demands, such as for tennis.

*Department of Education, Bureau of Research and Assessment, "Enrollment Projections for Public Schools in Massachusetts, 1975-1979", October, 1975.

b. Ask whether those who operate local recreation programs consider that recreation programs are now constrained by lack of adequate facilities (rather than, say, lack of staff or other problems).

c. Assess whether it is likely that the added recreational demands will be satisfied incidental to satisfying school needs. The site standards of the School Building Assistance Bureau result in adding one acre per 100 added pupils. Well managed, this space may be all the recreation space that a community need add as it grows.

d. Check quantitatively. Standards keep rising, but about 5 nearby acres of recreation space per 1,000 residents is not unreasonable for communities with less than 50,000 population*. This means that each added 100 residents may create a need for another half-acre of recreation space. A simpler and perhaps more reliable rule is that adding recreation space in direct proportion to population growth would probably, in most cases, more than keep pace with added demand:

$$\text{Added space justified} = \frac{\text{Population in proposed devel.}}{\text{Current population of community}} \times$$

Recreation acres now in use

e. Assess impact on special facilities or programs. Impact can be good or bad. Swimming might be made overcrowded, or it might be made justifiable for the first time.

3. WATER

Following are some key impacts to watch out for.

a. Need for a Public Water System. If there is now no public water system in the area, will the development accelerate the time when one is needed? Population growth makes public water supply more likely. This may mean creation of a new water district or expansion of an existing district (either step requires state legislation). Table 4-1 shows expectations of public water systems for residential areas.

b. Pollution. Would proposed development pollute water supplies by changing drainage patterns, increasing run-off and sedimentation, discharging wastes, or placing a sewage disposal system near wellfields or surface water bodies**? The result may be

*National Recreation and Park Association, "Outdoor Recreation Space Standards", New York, 1965.

**Article XI, State Sanitary Code requires a 100 ft. setback from a septic tank or leaching field to any municipal water supply. This is a general statewide standard and may not always be adequate to prevent pollution.

Table 4-1
LIKELIHOOD OF PUBLIC WATER SYSTEM

Population Density Persons/Sq. Mile	Equivalent Lot Size ^a	Likelihood of Eventual Public Water System
over 2,500	less than 1 acre	nearly certain
1,000-2,500	1-2 acres	eventually in most cases
500-1,000	2-4 acres	unlikely
less than 500	over 4 acres	virtually never

^aif fully developed

Source: U.S. Dept. of H.E.W., Public Health Service, Environmental Health Planning Guide, 1962.

lower water quality, requiring some form of treatment or, conceivably, need for another water supply.

c. Effect on Water Level. If the development has its own wells, will it reduce groundwater level in surrounding areas, possibly affecting public wellfields?

d. Need for Public Improvements. If the development will use the public system, will it require major improvements in that system? Improvements might include:

(1) New water mains. Existing mains may have to be extended a considerable distance to the site. Nearby mains may have to be replaced by larger ones or supplemented in order to provide adequate pressure for fire fighting. Check with water officials and the fire chief. (A major apartment complex, for example, might need 12" mains rather than the present 6" or 8" mains in the area.) Arrangements often provide for the developer to pay part or all of the cost for the new mains.

(2) Additional storage capacity. Larger storage facilities may be needed to provide adequate reserves for peak demand plus fire fighting. Standpipes and water tanks may have to be built or expanded; insurance rates go up if underwriters believe reserves are inadequate. Concern may be greatest for very large new developments (such as an industrial park) which increase needed fire flows in the community*.

*See Insurance Services Office, "Guide for Determination of Required Fire Flow", New York, 1974.

(3) Additional supplies. Extra demand from the development may exceed the capacity of existing water supplies. This can sometimes be readily dealt with by increasing pumping capacity or tapping another known groundwater or surface water source. If these solutions aren't available, consequences may be much more serious. Search for a new source may prove fruitless. Water may have to be purchased from elsewhere (e.g., from another district in the community, a nearby city or town, the M.D.C.). It often takes years to find and develop a new source or to work out arrangements with another district; water shortages may occur in the meantime. By contrast, new mains, standpipes, pumps are costly but relatively straightforward improvements.

Where impacts may be significant, the proposal should be carefully reviewed by the Water Commissioners (or department) and/or by outside engineers (provided by the developer or the community). Following is a quick general approach for considering how proposal water use might affect public water supplies.

3.1 Review Existing Conditions and Plans

Water system records, personnel, and engineering studies may indicate:

- water use on the average and maximum days during the year (maximum, rather than average, demand is sometimes the more important design criterion);
- supply capacity: how many gallons can be pumped on a single day;
- how current use compares with capacity; proposal impact will naturally be much more critical if the system is already close to capacity;
- problems that have already been identified;
- improvements that are already planned or underway.

3.2 Estimate Water Use for the Proposed Development

How many gallons would be needed on the maximum day?

a. Residential Development. Residential water serves two main purposes: household use and sprinkling. Household consumption often averages about 250 gallons per dwelling per day*. Sprinkling varies widely, depending on the size of the lawn. In

*F.P. Linaweaver, John Geyer and Jerome Wolff, "A Study of Residential Water Use", for Federal Housing Administration, 1967.

an apartment complex only 100 gallons per dwelling might go to sprinkling. In a 1-acre or 2-acre area, sprinkling might reach 1,000 or 2,000 gallons per dwelling on the maximum day*. Implications:

(1) One can roughly estimate water use per dwelling. If proposed densities aren't very different from existing densities in the community, look at current water records for the system:

Max. Day Use per Dwelling Unit = $\frac{\text{Total Residential Use on Max. Day}}{\text{\# of Residential Connections}}$

Be careful to count only residential uses; don't count stores and factories**.

For a rough estimate, maximum day use is often about 400-800 gallons per dwelling (low for apartments, high for single-family homes)***.

(2) Increasing residential density does not always increase maximum day water use. This is the surprising finding of a nationwide study****. Water use per acre may not change very much whether there are, say, 1 unit or 5 units per acre, since total lawn area remains about the same. It may therefore sometimes be useful to estimate water use per acre (total current residential use ÷ residential acres).

At still higher densities (especially more than 10 units per acre), water use clearly does increase with increasing density. Household consumption for each extra unit is greater than reduced sprinkling from reduced lawn area.

b. Non-Residential Development. Water use varies enormously by type of development, depending on needs for employees, visitors, and industrial processes. Examples (for illustrative purposes, some data is quite old):

*Source: Richard Bond and Conrad Straub, ed., CRC Handbook of Environmental Control, Vol. II, Water Supply and Treatment, 1972.

**Some per capita figures are based on all water use divided by population. The result can be misleading if there are large commercial or industrial users in the community.

***Assumes maximum day is about double the average day, about 2.5-4.0 persons per dwelling, and 60-100 gallons per capita on an average day. See: estimates of Mass. Department of Public Health; Real Estate Research Corporation, The Costs of Sprawl, for U.S. Council on Environmental Quality, 1974; Linaweaver, Residential Water Use

****Linaweaver

<u>Land Use</u>	<u>Rough est., gallons per day per employee*</u>
office	15
shopping center	30
printing	300
chemicals manufacturing	2,000
paper manufacturing	21,000

Even for the same type of development, water use may vary widely among individual establishments. Restaurants, for example, may generally average 35 gallons per seat per day, but counter seats in a turnpike rest area might generate 10 times as much**.

Each non-residential development should therefore be reviewed in terms of its particular characteristics. The developer may be asked to provide an estimate of daily water use. One can also look at similar establishments elsewhere.

3.3 Compare the Development to Current Water Use and Capacity

Does the development substantially increase water use in the district? Will existing supplies be adequate to meet the extra demand? Even if the development won't exceed existing capacity, it may still cause problems: making it hard to deal with major fires and to accommodate other expected development and rising demand from present users (perhaps increasing about 1% per year***).

3.4 Consider What Improvements May Be Needed

Ask those in charge of the water system. Issues can include timing, cost, and complexity of arrangements.

4. SEWERAGE

Concerns vary, depending on whether the development will provide its own sewage disposal or be served by a public system.

*Total water consumption for all purposes divided by number of employees; Bond and Straub; Metcalf and Eddy, Inc., Wastewater Engineering: Collection, Treatment Disposal; Herr Associates estimate for shopping centers based on water records for Burlington Mall, South Shore, and North Shore Shopping Plazas.

**Metcalf and Eddy, Waterwater Engineering.

***New England River Basins Commission, How to Guide Growth in Southeastern New England, May, 1975.

4.1 Private Disposal

What degree of assurance is there that the system will prove adequate not only initially, but in the long run? Initial adequacy can be assured by capable administration of the State Sanitary Code and Board of Health regulations. Long-term adequacy is far more complex, since initially adequate systems often, in time, prove troublesome, leading to eventual provision of public sewerage. Expectations for residential development are as follows:

Table 4-2
LIKELIHOOD OF PUBLIC SEWERAGE

Population Density Persons/Sq. Mi.	Equivalent Lot Size	Likelihood of Eventual Public Sewerage
Over 5,000	Under $\frac{1}{2}$ acre	Nearly certain eventually
2,500-5,000	$\frac{1}{2}$ to 1 acre	Eventually in most cases
1,000-2,500	1 to 2 acres	Unlikely
Less than 1,000	Over 2 acres	Virtually none

Source: U.S. Dept. of H.E.W., Public Health Service, Environmental Health Planning Guide, 1962.

Poor soils, steep topography, high water table, or proximity to critical waterbodies increase likelihood of eventual sewerage; good soils, flat land, and deep water table reduce likelihood. There are lots of exceptions. A recent soil survey by the U.S. Soil Conservation Service can provide valuable information.

The Planners Handbook contains a table relating soils, lot size, and other site considerations*. If the proposed development violates the standards of that table, skepticism about long-term adequacy is well justified, percolation tests notwithstanding.

4.2 Municipal System

If the development is likely to be served by the municipal sewerage system, several questions follow.

a. Is there adequate trunkline capacity to serve the development? The question should be answered by a technician, but if problems already exist, or if the development is only a tiny fraction of the current total load served by the line in question, the answer may be obvious, one way or the other. Ask those in charge of the sewerage system.

*Massachusetts Federation of Planning Board, Planners Handbook Braintree, MA, Revised 1975.

b. Is there adequate treatment plant capacity to serve the development? Again the question requires technical response, but again the answer may be obvious. Ask those in charge.

Sometimes capacity inadequacy can be remedied by relatively inexpensive actions such as blocking stormwater infiltration to reduce peak flows. On the other hand, sometimes a relatively small increment in sewage flows is the last straw, precipitating major system additions. Again, lay judgment is difficult.

5. STORM DRAINAGE

Development replaces soft absorbent surfaces with hard impervious ones, and often replaces slow over-ground runoff routes with rapidly-flowing piped underground ones. The result is that storm water gets to the bottom of hills or into streams faster, increasing peak flows (and often reducing off-peak flows since less water is held back to flow later). The public facility impact is that storm drainage facilities such as storm sewers or culverts downstream of a development may prove inadequate and require expensive replacement.

Modern design and management techniques can virtually eliminate the problem. In many locations, it is feasible to insist upon development design to avoid peak flow increases through use of recharge, roof storage, parking area storage, and grassed ponding areas*.

Further, initial design of downstream facilities can be based upon the estimated flows given full development uphill, rather than assuming uphill areas will remain undeveloped.

If regulations and earlier design practices didn't follow this approach, development is likely to add to peak runoff. The computations for runoff are complex. To get a "ballpark" sense, the following "runoff multipliers" might be considered.

Developed for single-family lots, runoff = 2 times undeveloped runoff rate.

Developed for multi-family units, runoff = 3 times undeveloped runoff rate.

Developed for business, runoff = 4 times undeveloped runoff rate.

The impact on the total drainage catchment area involved can be crudely estimated as:

*Urban Land Institute, American Society of Civil Engineers, and National Association of Home Builders, Residential Storm Water Management, 1975.

$$\frac{\text{Area of proposed development} \times \text{runoff multiplier} \times 100}{\text{Area of total drainage catchment area}} =$$

% increase in runoff

For example, 100 acres of undeveloped land are proposed for multi-family use. It is part of a 1,500 acre drainage basin served by a critical road culvert.

$$\frac{100 \text{ acres} \times 3 \times 100}{1,500 \text{ acres}} = 20\% \text{ increase in runoff}$$

If the increase looks critical, have it analyzed by a professional. There is much more than shown here: the increase in peak flow may be either a great deal more or a great deal less than 20%.

6. SOLID WASTE

Two "break points" are involved in solid waste: the point at which pickups begin, and the point at which the disposal facility is overtaxed (incinerator) or exhausted (landfill).

6.1 Collection

Justification for collection service in relation to density is shown in the following.

Table 4-3
JUSTIFICATION FOR SOLID WASTE COLLECTION

Population Density (Persons/Sq.Mi.)	Equivalent Lot Size	Economic Justification for Collection Service
Over 2,500	less than 1 acre	Service justified
1,000 to 2,500	1-2 acres	Service normally justified
500 to 1,000	2-4 acres	Service seldom justified
Under 500	over 4 acres	Service rarely justified

Source: U.S. Public Health Service, Environmental Health Planning Guide.

By calculating the difference in density which a proposed development makes, one can estimate the degree to which it accelerates the time when collection service will be required.

6.2 Disposal

Nationwide, the rate of solid waste generation had been rising for many years until stabilizing in the past few years at about 0.6 tons per resident per year. Residents of motels, universities, and other institutions generate waste at about one third that rate, or 0.2 tons per resident per year. For businesses, the following is an approximation.

Table 4-4
SOLID WASTE GENERATED BY BUSINESSES

	Tons per employee per year
Offices	0.4
Textile, apparel manufacturing	0.7
Transportation, communication, utilities	1
Metal, machinery manufacturing	1
Printing, publishing	4
Chemical, plastic manufacturing	7
Paper manufacturing	9
Food processing	10
Wood products, furniture	15

Source: adapted from Raytheon Service Co., Solid Waste Management Study Report, for Mass. Dept. of Public Works, 1972.

The remaining capacity per day for a local incinerator or total remaining capacity for a landfill can normally be estimated by the operating agency. Using these multipliers, one can estimate the extent to which a proposed development will draw on that capacity.

7. OTHER COMMUNITY FACILITIES

As communities grow, pressure on a broad range of community facilities grows. First, more people simply means more people having business at town offices, borrowing books at the library, and having homes needing fire protection. Second, service-level expectations are higher for larger communities. Inconveniences or lack of amenities accepted in a rural community cease to be acceptable as the community grows. Third, better facilities generate greater usage. A municipal library may attract few users, but per capita usage may grow enormously as facilities improve.

Often the change is subtle and gradual, as when the same town office building which served a town of 6,000 continues to serve it at 15,000, but does so by virtue of a series of displacements over time: having moved the town meeting to the school auditorium, police to a separate police station, public works to a separate building, and the welfare department to an adjacent town.

Development demand for several types of facilities are discussed below.

7.1 Libraries

The American Library Association suggests a library floor space standard of about 0.7 square feet per capita for communities

under 50,000 residents*. We find few communities which meet that standard, but it probably is a fair measure of growing demand. Thus, a development bringing 1,000 new residents brings demand for about 700 square feet of library space.

7.2 Office Space

By observation, we judge that demand for floor space for town offices and police headquarters also grows by about three-quarters square foot per capita.

7.3 Fire Protection Facilities

Demand for fire protection facilities in communities of under 50,000 largely depends on the pattern of development. Insurance rates depend, among other things, upon proximity to fire stations. A usual standard for proximity is:

Table 4-5
PROXIMITY OF FIRE STATIONS

	Engine, Hose or Engine-Ladder Co.	Ladder Co.
Commerce, Industry		
Dense	3/4 mile	1 mile
Other	1 1/2 "	2 "
Residential		
Multi-Family	1 1/2 "	2 "
Lots smaller than 1 acre	2 "	3 "
Lots larger than 1 acre	4 "	4 "

Adapted from American Insurance Association (National Board of Fire Underwriters), "Fire Department Standards - Distribution of Companies and Response to Alarms", Special Interest Bulletin No. 315, January, 1963.

Buildings with dimensions, either horizontal or vertical, much greater than others in the community can precipitate demand for fire fighting equipment not otherwise available or required. The equipment, in turn, can require types of garage space not now available. Check with the fire chief: this could be an expensive and unanticipated impact.

*American Library Association, Public Library Association, "Interim Standards for Small Public Libraries: Guidelines Toward Achieving Goals of Public Library Service", Chicago, 1962.

CHAPTER 4A

PUBLIC FACILITY IMPACTS OF DRUM HILL REZONING

SUMMARY

Facility requirements attributable to the Drum Hill shopping center are few and not demanding. The center may require some water system improvements, especially larger mains in the Drum Hill area, but we don't foresee the need for other major public improvements (except for traffic improvements, which would be extensive and are discussed separately in "Traffic Impacts of Drum Hill Rezoning").

Public facility needs for industrial development can't be predicted without a specific development proposal. We don't know of any inherent, critical problems, however.

Potential water and sewer impacts are discussed below.

WATER

Proposed Zoning

A regional shopping center might use 80,000 gallons on an average day, 100,000 gallons on a summer day*. The developer has indicated that water will not be used for air conditioning (which if used could further increase demand to, say, 150,000 gallons per day in the summer).

We assume that water would be provided by the North Chelmsford District (other possibilities: a single town-wide water system or use of the nearby Lowell system). Issues include:

a. Distribution System. The site is now serviced by 6" and 8" mains. A 12" main may be needed from Richardson Road in order to provide adequate fire protection and water pressure. Cost might be roughly \$50,000 (\$30 per foot). The North Chelmsford district anticipates that the developer would pay some of this cost; his fire insurance ratings relate to water adequacy at the site. The water consolidation study suggested the need for such a main, even without development on the site**.

*Based on discussion with the developer and water records for Burlington Mall and North Shore Shopping Plaza.

**Weston & Sampson, Report to Water District Consolidation Committee, Chelmsford, Ma., February, 1975.

b. Supply. The North Chelmsford Water District system capacity is now about 1.8 million gallons a day*. In 1974, maximum use was about 1 million gallons a day**. The center might increase maximum use to about 60% of capacity. This isn't likely to cause immediate problems, according to the North Chelmsford Water District. In the long run, the center might accelerate the time when the District needs additional water supply, perhaps by a year or two***.

c. Storage. The district now has 2.2 million gallons storage capacity, which it considers adequate. Weston & Sampson recommend an additional 1 million gallon storage facility by 1980 to provide for population growth and fire emergencies****.

The shopping center does not seem likely to be a key factor in planning for new storage facilities since (a) its required fire flows probably do not exceed the maximum already needed in the district*****, and (b) choice of assumptions about future population growth and residential water use appear to be more critical in deciding on storage needs.

If districts are consolidated, new connecting mains to the Center district could substitute for new storage facilities.*

Current Zoning

Industrial development on the site would also probably require larger water mains in order to provide fire protection.

Storage and supply needs depend on the particular type of industry. Clothing manufacturing and research and development companies use relatively little water; food processors, chemical plants, breweries use a great deal. It seems unlikely, however, that very heavy water users would choose to locate where water supply is quite limited.

*Weston & Sampson, Report to Water District Consolidation Committee, Chelmsford, Ma., February, 1975.

**Water Commissioners of the North Chelmsford District, "69th Annual Report, for the Fiscal Year Ending June 30, 1975".

***It is not clear when additional supplies will be needed. Mr. McEnany, chairman of the district commissioners, doesn't foresee supply problems in the near future. Weston & Sampson are more pessimistic, assuming rapid population growth and high water consumption. If Weston & Sampson are right, additional supplies might be needed by 1985; the shopping center would, however, be equivalent to just one year's anticipated growth in the district. Whatever the assumptions, the shopping center will probably not be a critical factor.

****Est. cost \$475,000.

*****Weston & Sampson based storage needs on fire flows for the Princeton St.-Foundry St. industrial area: 4,000 gallons per minute for 10 hours. (Insurance Service Office standards have since changed, generally reducing duration but increasing flow per minute.) As a rough estimate, the center might require 3,000 gallons per minute for 3 hours.

SEWERAGE

Proposed Zoning

The shopping center might generate 70,000-80,000 gallons of sewage per day (roughly the same as annual average water use). How will this be disposed of? It is unclear whether, when, and in what form Chelmsford will provide a public sewerage system*. The shopping center is therefore likely to either:

1. provide its own on-site sewage treatment plant; or
2. tie into the Lowell sewer system; the Northern Middlesex Area Commission has suggested Lowell sewerage for the rotary area**.

In either case, the center wouldn't require public facility improvements in Chelmsford.

We don't think the center would be a key factor in pushing the town toward municipal sewerage. The center would increase total town sewage flows by less than 5%***. Federal orders and funding, regional arrangements, overall population density, and local preferences are far more important in determining sewerage plans.

Current Zoning

Industrial development is also likely to use the Lowell sewer system or provide its own on-site systems. Sewage flows vary by type of industry and can't be predicted without a specific development proposal (sewage flows roughly correspond to water usage). We don't foresee any special problems at this location compared with other industrial sites in town.

*Parsons, Brinckerhoff, Quade & Douglas, Chelmsford Liquid Waste Study for Chelmsford Sewer Commission, 1974.

**Northern Middlesex Area Commission, "Preferred Long-Range Sewer and Water Plan", 1972.

***Sewage flows in the town are at least 2 million gallons a day (average daily water use is 3.2 million gallons according to Weston & Sampson).

CHAPTER 5

ECONOMIC IMPACTS

Proposed development may significantly affect jobs and businesses. These economic impacts are the subject of this chapter. Effects on municipal finances are dealt with separately in the chapter on Fiscal Impacts.

Following are general considerations in evaluating economic impacts:

Relation to Community Needs. How will the proposal affect the community's particular needs and resources? More jobs may be good, may be bad. Low-skilled or seasonal jobs may be desirable some places, undesirable elsewhere. Needs have already been identified in many communities by Overall Economic Development Programs (OEDP's), Master Plans, industrial development agencies, regional planning agencies, or local business groups. Such plans and organizations can be very valuable in evaluating new development.

Variety of Impacts. The number of new jobs may be the single most dramatic economic impact of a proposal. There are often other significant impacts, however, which should not be overlooked, such as the type of jobs and the effects on existing businesses.

Who is Affected? Will the proposal affect current residents or only affect future characteristics of the community (e.g., by affecting people who now live elsewhere but may move into or commute to the community)? A new high-technology r&d plant, for example, might bring highly-trained, highly-paid professionals into a town, thereby raising the average incomes and skill levels of residents of the town, but leaving the previous residents of the town no better off than before. Effects on current residents and on the overall future of the community may both be important. They are not identical, however, and should be distinguished.

What Happens if the Proposal is Rejected? If the proposed development is designed to serve purely local needs (a small drug-store, professional office building, barber shop), rejecting the development on one site in the community will almost certainly mean that the same jobs, taxes, and activities will instead occur on an alternative site in the same community. Thus, a decision to allow or deny such a development on any given site almost certainly has no economic impact, even though the development involves income, jobs, and taxes.

Other developments are tied not to the community, but to the region. Denied at one location, a major shopping center, a regional insurance office, or an industry drawing on special regional re-

sources will almost certainly be built on an alternative site in the same region, but perhaps not in the same community. Taxes will be lost to the community, but jobs and services provided will only be moved, perhaps to a location still well within commuting range of that community's labor force. Decisions to deny such developments certainly have economic impact, though that impact may be only partial.

Finally, there are "foot-loose" activities which are not tied to the region at all: if not developed at a proposed site, all of their economic benefits will possibly be lost. Good examples are major power plants, government facilities such as the much-sought solar energy lab, and home offices of national corporations.

Impacts are discussed separately for non-residential and residential development.

1. NON-RESIDENTIAL DEVELOPMENT

New factories, stores, institutions can affect the local economy in a number of ways. Concerns vary from one community to another, but common questions about proposed development might include:

1. Employment

- a. How many jobs will be created, including construction and permanent jobs?
- b. Will the firms hire locally or bring workers from other parts of the state or country?
- c. Would development substantially increase the number of jobs within commuting range of local residents?
- d. What kind of jobs will be created? Do they meet needs of local residents?

2. Business Opportunities

- a. Would the new uses compete for sales with existing local businesses? Are failures and vacancies likely?
- b. Would existing commercial areas be strengthened and supported?
- c. Are the new activities likely to buy goods and services from local businesses?
- d. Would the development provide space for local entrepreneurs?

3. Other Effects

- a. Would goods or services be "exported" to other parts of the state or country, bringing outside income into the area?
- b. Would new activities diversify the economy?
- c. What would be the effect on nearby property values?
- d. Would there be other important indirect effects?

These issues are discussed briefly below.

1.1 Employment

A. Number of Jobs. The developer may estimate the number of construction and permanent jobs, or the following rough estimates may be used.

(1) Construction Jobs. Each million dollars of construction may mean about 30 man-years of labor on the site*. Man-years are a good general measure, although they are of course split among many craftsmen each working for a short period of time. Construction costs (excluding financing, land, architects) may be obtained from the developer. Table 5-1 shows some rough cost estimates and the number of construction jobs that might be required for each 1,000 square feet of floor area.

(2) Permanent Jobs in the Development. Table 5-2 shows how many square feet there might be per employee. Offices, for example, have about 200 s.f. per employee. A 200,000 s.f. office building might thus have about 1,000 workers.

(3) Indirect Jobs. New development indirectly creates other jobs elsewhere in the economy as supplies are purchased and workers spend their wages. But these effects are hard to measure and may be small for a local area (purchases tend to "leak out" to other parts of the state or country: steel girders may come from the midwest, lawbooks from Minnesota, a paper mill's lumber from outside the state, etc.). Instead of computing the number of indirect jobs, it may be more appropriate to look for aspects of the development which are especially likely to increase local employment. For example, note if the development (a) is near a shopping center, so workers may stop there on the way home from work; (b) is especially likely to buy supplies from local businesses; or (c) exports goods and services outside the area, thus obtaining outside income.

*We assume labor is about 50% of construction costs, a man-year is equivalent to 2,000 hours, and hourly wages range from about \$7 to \$10 (source: Association of General Contractors). The Boston Redevelopment Authority has assumed slightly more than 30 man-years of employment per million dollars of construction (e.g., 32 for offices, 33 for retailing, 34 for factories). "Jobs for Boston's Future - Expanding the City's Economic Base Through Capital Investment - Mayor Kevin White's Program", November, 1975.

Table 5-1
EST. CONSTRUCTION JOBS BY BUILDING TYPE

Building Type	Est. 1976 Construction Cost Per Sq. Ft. ^a	Est. Man-Years Per 1,000 Sq. Ft. ^b
Warehouse	\$15-20	0.5-0.6
Factory	15-25	0.5-0.8
Shopping Center, Retail Store	15-25	0.5-0.8
Motel, Hotel	25-35	0.8-1.1
Office		
low-rise	25-40	0.8-1.2
high-rise	40-55	1.2-1.7
Restaurant	30-45	0.9-1.4
School	30-45	0.9-1.4
Bank	40-50	1.2-1.5
Hospital	55-75	1.7-2.3

^aHerr Associates estimates based on Means, Building Construction Cost Data, 1975; McGraw Hill, Dodge Construction System Costs, 1975; and Pasadena & Foothill Chapter, AIA, Preliminary Cost Guide, Complete System for Total Project Development, 1974.

^bAssumes 30 man-years per million dollars of construction costs.

Table 5-2
SQUARE FEET PER EMPLOYEE

Building	Average	Common Range
office ^a	200 s.f.	150- 225 s.f.
retail ^b	500	250- 750
manufacturing ^c	550	250-1,500
warehouse ^d	800	500-1,500
hotel/motel ^e	7 rooms	

^aB.R.A. estimates about 210 sq. ft., "Jobs for Boston's Future..."

^bSq. ft. gross leasable area. Varies by type of store: low for supermarkets, drugstores; high for furniture and hardware stores. See: Trip Generation by Land Use, Part I, A Summary of Studies Conducted, Maricopa Association of Governments, Arizona, 1974; U.S. Census of Retail Trade, 1972 (Sales per employee); Urban Land Institute, Dollars & Cents of Shopping Centers, 1975 Washington, D.C. (sales per sq. ft.).

^cVaries widely: low for precision instruments, primary and fabricated metals, apparel, chemicals; rubber, plastics, printing; high for paper, furniture, metal machinery, wood products, stone, clay, glass, concrete. See: Trip Generation; Boston Economic Development and Industrial Commission, "Boston's Industry", 1970.

^dSource: Trip Generation.

^eSource: B.R.A., "Jobs for Boston's Future..."

B. Outside Hiring. Are a large number of the new jobs likely to be filled by workers from outside the region? This may sometimes happen in non-metropolitan or small metropolitan areas where:

- a major construction contract is involved (e.g., for a power plant, oil refinery, university complex);
- the firm has highly specialized skill requirements (e.g., if IBM locates in a rural town);
- the firm will employ an exceptionally large number of people compared to the existing labor supply*.

Hiring from outside the region can mean an infusion of new people with new abilities and ideas. It also means that the development offers fewer job opportunities for local residents and, in some cases, might increase housing demand as outside workers move into the region temporarily or permanently. Some of the new housing might be built in the community, with its own fiscal, social, and economic impacts.

C. Increase in Job Opportunities. 1,000 permanent jobs in a development should not be interpreted as 1,000 new jobs for community residents. Only a fraction of the jobs will go to residents, the rest to workers from other cities and towns (for example, only 1/3 of the jobs in Boston's recent office buildings were filled by Boston residents**). It is very difficult to predict who will actually fill the jobs (and who in turn will fill the jobs that the new employees leave behind).

It may be more appropriate to think of the development's jobs as an increase in the employment choices and opportunities accessible to community residents. The number of jobs in the development might be compared with the number of jobs already within commuting range of local residents (perhaps 30-45 minutes):

% Increase in Job Opportunities =

Jobs in Development
Current Employment in Community and Surrounding Towns

*The current number of people working or looking for work (the "labor force") may be obtained from the state Division of Employment Security, "Massachusetts Trends in Labor Force, Employment Unemployment". The labor force is usually about 40% of an area's population. At any point in time, about 5% of an area's population may be seeking new employment.

**Boston Redevelopment Authority, "A Demographic Revolution: The Impact of Office Building and Residential Tower Development in Boston", December, 1972.

Current employment for each city and town can be obtained from the State Division of Employment Security, "Employment and Wages in Establishments Subject to the Massachusetts Employment Security Law". Coverage by this data is far from complete (government, agriculture, and some other categories are left out) but it may provide a rough basis for the current number of jobs.

D. Type of Jobs. The community should consider the type of jobs that would be offered. Are they the kind that community residents can or want to apply for? Job needs are different in each community. In some, the key concern may be year-round jobs, in others part-time second jobs would be especially valuable. Relevant job characteristics might include:

- Wages. Table 5-3 shows average annual wages in different industries.

- Skills. Table 5-4 shows occupations required for different industries. How does the mix of new jobs compare to the skills and occupations of current residents, especially those now unemployed?* Do jobs and skills match? Are the types of new jobs attractive? Are they attainable? Would a job training program be needed or useful? Is one anticipated?

- Sex. Are jobs likely to go mainly to men or women?**

- Full-time or part-time.

- Year-round or seasonal.

- Labor conditions, such as on-the-job training, career ladder, stable employment, unionization.

1.2 Business Opportunities

New development can affect business opportunities in a number of ways.

A. Competition. Will new commercial development draw a substantial number of customers away from existing community stores? This may not be a major concern where:

- residents now shop outside the community for items to be sold in the new development. If people now go to a department store miles away, a new department store in town may offer little direct competition to local merchants.

*The U.S. Census shows the 1970 occupations for all residents and for those who were then unemployed; "Social and Economic Characteristics".

**Also available for each industry from the 1970 Census, but conditions are changing.

Table 5-3
AVERAGE ANNUAL WAGES IN MASSACHUSETTS, 1974

Economic Activity	Average Annual Wage
Agriculture	\$ 7,800
Mining	12,000
Construction	12,200
Manufacturing	10,200
Ordnance	16,900
Food	9,800
Textiles	8,500
Apparel	6,300
Furniture	8,300
Paper	10,400
Printing	10,000
Chemicals	12,200
Petroleum, Coal	13,600
Rubber, Plastics	9,200
Leather	7,400
Stone, Clay, Glass	11,800
Primary Metal	11,000
Fabricated Metal	10,400
Machinery (not electrical)	11,700
Electrical Equipment	10,600
Transport Equipment	12,700
Instruments	11,700
Transportation, Communications, Utilities	11,200
Passenger Transit	5,000 (plus tips)
Trucking	11,600
Air Transport	14,700
Communications	11,600
Utilities	13,500
Wholesale & Retail Trade	7,000
Wholesale	11,300
Building Materials, Farm Equip. ...	9,700
Dept. Stores, etc.	5,400
Food	5,800
Auto dealers, gas stations	8,800
Apparel	5,600
Furniture and appliances	7,500
Restaurant	3,600 (plus tips)
Finance, Insurance, Real Estate	9,700
Banks	8,900
Insurance Carriers	10,100
Real Estate	8,000

Table 5-3 (cont.)

Economic Activity	Average Annual Wage
Services	\$ 7,900
Hotels, motels	4,500 (plus tips)
Personal services	5,300
Business services	8,200
Auto repair	7,300
Amusements	5,900
Health care	7,700
Education	9,300
Non-profit organizations	6,000
Other (professional) services	12,600

Source: Mass. Division of Employment Security, "Employment and Wages in Establishments Subject to the Massachusetts Employment Security Law, State Summary 1974", rounded off to nearest \$100.

Table 5-4
OCCUPATIONS FOR DIFFERENT INDUSTRIES

Industry	% of Industry Workers in Each Occupation								TOTAL ^a
	professionals, managers	clerical, sales	craftsmen	operatives	laborers	service workers			
construction	13	7	57	6	12	1			100
manufacturing	18	16	18	41	1	1			100
transport, communications, utilities	14	28	21	24	6	3			100
wholesale trade	20	44	10	19	5	1			100
retail trade	16	41	8	8	4	18			100
finance, insur., real estate	21	70	1	--	1	4			100
business & pro- fessional services	52	18	5	1	1	20			100
other services	14	12	3	11	2	53			100
TOTAL ALL INDUSTRIES	25	26	13	17	3	12			100

^adoes not add due to rounding

Source: U.S. Census, 1970, Detailed Characteristics

- new development is relatively small compared to existing commercial development in the town.

- substantial population (or income) growth is expected in the area to be served by the new development. Rapid growth can support additional stores without creating vacancies.

Where competition seems serious, the developer's market analysis may suggest where sales will come from. Another approach is to:

(1) Estimate annual sales in the new development (from the developer or, say, \$70 per sq. ft., \$130 per sq. ft. for super-markets)*.

(1A) If the development will serve several towns (e.g., a regional shopping center), estimate what share of its sales will come from stores in your community. The fraction depends on existing commercial development in the community compared to other towns to be served by the new development (U.S. Census of Retail Trade indicates 1972 sales for each community).

(2) Compare new development sales (1 or 1A) to current sales for that category of store in the community (U.S. Census of Retail Trade). This suggests the seriousness of potential competition.

B. Existing Commercial Areas. New development in or near existing commercial areas may strengthen those areas. New offices, stores, hotels attract more people to an area. This means more potential customers for existing stores and services, a principle well-illustrated in successful downtowns and regional shopping centers**. Important implications:

(1) New stores can have two opposite effects: capturing customers but also inducing potential shoppers to nearby stores. The overall effect may be to shift sales from one part of the community to another.

(2) The exact location and layout of new development may be very important. Does the design encourage or discourage patrons and employees from shopping at existing stores (e.g., by providing 1-stop parking, convenient walkways, joint access, etc.)?

*Per sq. ft. of gross leasable area. Dollars and Cents of Shopping Centers provides estimates of sales per sq. ft. for specific kinds of stores.

**Even directly competitive stores often do better when they are close together, offering shoppers a wider array of goods to choose from.

C. Local Suppliers. Is the new activity likely to purchase supplies from other local firms (e.g., a container company buying from a local paper mill)? Look for specific arrangements or possible connections with local contractors and merchants. Other general considerations:

(1) Small firms generally use outside services more than large firms (a large company may have its own photocopying, printing, stationery, legal and medical departments);

(2) In terms of the state as a whole, finance, services, construction, agriculture, and trucking seem to create the greatest additional economic activity. Manufacturing has smaller indirect impacts, since many raw materials come from outside the state*.

D. Space for Entrepreneurs. Will the development provide spaces for new local businesses? Things to look for:

- specific arrangements to accommodate local entrepreneurs (e.g., a mall with booths to be rented to local people);

- spaces suitable for local businesses (such as complexes of small shops or offices) rather than spaces suitable only for major outside firms;

- any displacement of existing local businesses from the site. Relocation may be a difficult problem, especially for small businesses or those with very specialized site requirements.

3.3 Other Effects

A. Export Industries. Will the new development simply serve existing population (with shops, services, hospitals, schools...) or will it sell goods and services to people outside the region? "Export" or "basic" industries earn outside dollars and support population and employment growth. Regional population growth requires "basic" job development or else results in more out-commuting or unemployment. ("Taking in each other's laundry" doesn't provide enough jobs for all the region's workers.):**

Export industries include those which:

- ship goods or provide services to state and national markets. Examples: manufacturing, agriculture, major offices for large organizations (e.g., the I.R.S. in Andover);

*Department of Hotel, Restaurant and Travel Administration, Univ. of Mass. at Amherst, The Economic Impact of Tourism on the Commonwealth of Massachusetts, December, 1974 (Table IV-1).

**It is not always easy (or useful) to distinguish export and local service jobs, especially in metropolitan communities. See Hans Blumenfeld, "The Economic Basis of the Metropolis, Critical Remarks on the 'Basic-Nonbasic' Concept", Journal of the American Institute of Planners, 1955.

- bring outsiders to the region, where they spend money (earned elsewhere) on food, lodging, supplies, etc. Examples: tourism, summer homes, universities, military bases.

B. Diverse Economy. Activities which diversify the region's economy may be especially valuable. Areas now dependent on one or two major export industries may experience severe unemployment if those industries close, move away (as has happened with textiles, shoes, defense contracts) or occasionally have bad years (e.g., construction and tourism). New activities which broaden the region's economy reduce that dependence and may assure greater economic stability.

C. Nearby Property Values. Nearby property values may increase or decrease, depending on the development's social, aesthetic, economic and traffic consequences. Public discussion often focuses on the change in property values. We urge caution in making predictions, however. The issue is often loaded. All neighbors are experts. Effects are sometimes quite complex. Following are some ways to deal with the subject.

(1) Identify impacts which seem clear and large (an unsightly factory will certainly reduce values of nearby residences).

(2) Focus on the area immediately surrounding a major development, where effects are likely to be strongest.

(3) Analyze the source of neighbors' concerns. Neighbors' predictions about property values usually reflect other concerns about the proposal: its appearance, traffic, noise, occupants. These concerns should be dealt with directly.

(4) Recognize the range of possible impacts. Added traffic on a street may decrease the value of residential properties, but increase the value of commercial properties. A parcel may become less valuable in its current use (e.g., as a single-family home) but more valuable for a future use (as a gas station, apartment house, ...). By reducing the supply of vacant land in an area, the development can push up the price of remaining vacant parcels. Very large developments may saturate the local market for that land use and temporarily depress nearby land values*. The proposal might pave the way for subsequent intensive development in the area; it may set a precedent for future public decisions, encourage other developers, and precipitate major public facility improvements which would also serve surrounding property.

*The new town of Columbia, Md., reduced land values in its immediate vicinity by capturing a large share of potential new residents. Mohammed Qadeer, "Local Land Market and a New Town: Columbia's Impact on Land Prices in Howard County, Maryland", Journal of the American Institute of Planners, March, 1974.

(5) Do not make detailed predictions. Lay judgment may well be challenged in terms of reliability and fairness.

D. Other Economic Impacts. Consider other economic impacts which seem significant. For example, a new firm which greatly increases demand for certain types of workers (e.g., female clerical help, skilled craftsmen, unskilled laborers) can pressure existing firms employing such people to increase wages. Whether and how new workers will be unionized affects existing unions in the community. Outside workers who will move into the community have their own economic impacts (see Residential Development below).

2. RESIDENTIAL DEVELOPMENT

Residential development also has economic impacts, although these are sometimes less visible than effects of new stores and factories.

2.1 Construction Jobs

New residential development creates construction jobs. Each dwelling unit involves about 1 man-year of on-site construction labor*.

2.2 Second Homes as an Export Industry

Second (and retirement) homes are really an "export" or "basic" industry. Occupants have earned money elsewhere, which they spend in the region for food, doctors, gasoline, property taxes, etc. This supports new jobs in the community and region. As a rough guess, we estimate that each second home supports 0.15 year-round jobs** (perhaps twice as many jobs during the peak season).

2.3 Retailing in the Community

New residents will support additional store sales in the community and surrounding towns. In 1972, the average Massachusetts resident spent about \$2,300 in supermarkets, gas stations, department stores, restaurants, and other retail establishments***.

Thus, 1,000 new residents might generate between \$2,000,000 and \$3,000,000 in retail sales. (Higher income residents more, lower income less; seasonal residents perhaps 1/5 as much as year-round residents). This would increase sales in existing stores and might

*Source: Massachusetts Association of Homebuilders.

**Herr Associates, "Social and Economic Impact, the Crumpin-Fox Development, Bernardston, Mass.", prepared for the Franklin County Planning Department, 1972. We have found roughly similar results on Cape Cod.

***U.S. Census of Retail Trade.

support another 30,000 to 50,000 sq. ft. of retail space (assuming annual sales of \$60 to \$70 per square foot).

How is this likely to affect local retailing? Some but not all of the new sales would occur in the community*. The community's share depends on how its commercial facilities compare with those of surrounding towns in terms of scale, variety, relative distance from the development, and room for expansion. For example, if the community contains a wide array of shops and is the dominant commercial center in its region, it may capture a very large share of new residents' purchases. A small community with a few local convenience stores might initially only attract a small share of purchases.

In the long run, major new residential development may create substantial pressures for new commercial development within the community. Approving large residential proposals may thus have long-range effects on commercial growth and commercial zoning in other parts of the community.

2.4 Employment in the Region

Large residential developments may attract new residents (and potential workers) into the region. Such a development could affect regional employment, and unemployment, in a number of ways (this doesn't apply to second or retirement homes which don't add new workers):

a. Labor force. New residents mean more people holding, or looking for, jobs in the region. There are normally about 400 job-seekers for every 1,000 residents.

b. Service jobs. Residents will support additional jobs in retailing, medical care, government and other services. We roughly estimate that 1,000 new residents support 150-200 new service jobs in the region**.

c. Need for export jobs. Residential development thus adds more job seekers than support for service jobs, perhaps twice as many. This suggests a need for increasing the number of jobs in export or basic industries. If export job growth doesn't keep pace, the result may be more long-distance commuting out of the region,

*An elaborate method for estimating local sales is described in Daryl Hellman, "External Impacts of Housing Developments, Calculating Effects on Commercial Property Values", Urban Land, October, 1974.

**The ratio depends on the size of the region, income of residents, and how one distinguishes "local service" jobs from total employment. 150-200 is a rough guess. See: Franklin County Planning Department and Herr Associates, "State of the Economy: 1975, Franklin County, Massachusetts"; and Edward Ullman, Michael Dacey, Harold Brodsky, The Economic Base of American Cities, Seattle: University of Washington, Center for Urban and Regional Research, rev. 1971.

increased unemployment, or vacant dwelling units (in or out of the new development).

The number of jobs needed can be compared with likely growth in basic industries. For reference, covered employment figures from the Division of Employment Security let you quickly identify past job growth in manufacturing; past growth in tourism, government, and other basic industries is much harder to determine.

2.5 Community Balance Between People and Jobs

Residential development also affects employment within the community. It adds to the labor force, but supports a much smaller number of service jobs within the community (many of the service jobs may occur in nearby towns, as suggested in the discussion of retail sales)*. If basic job growth in the community doesn't make up the difference, the result may be increased out-commuting to other towns.

Commuting due to the development can be compared with current net commuting patterns in the town**. Is the development likely to change these patterns very much? Increased out-commuting may not be critical economically but does affect people's time and energy, the social character of the community, and the local tax rate.

*In a small, rural town, 1,000 new residents might lead to 50 service jobs in the community; in a large town or city with major commercial development, 1,000 new residents might create 150 jobs within the community.

**The Office of State Planning has compiled 1970 U.S. Census data on the number of jobs and total labor force in each community (their data also shows commuting to and from every other city and town). State D.E.S. lists current labor force and covered employment in each community, providing a more recent picture of net commuting.

CHAPTER 5A

ECONOMIC IMPACTS OF DRUM HILL REZONING

SUMMARY

We have briefly considered economic impacts of commercial rezoning at Drum Hill rotary. Key findings include:

a. A regional shopping center is likely to provide twice as many jobs as an industrial park on the site (Table 5A-1). The center would provide slightly fewer blue-collar jobs but many more clerical and sales positions. These positions would especially appeal to housewives, teenagers and workers seeking second jobs.

b. Not all jobs would go to Chelmsford residents, of course, no matter what is built on the site. The shopping center would, however, substantially increase the number of jobs within the town, perhaps by 50%. This would reduce net out-commuting (now very substantial), improve the local balance between people and jobs, and provide convenient job opportunities for Chelmsford residents.

c. The center will compete with some existing Chelmsford stores. To some extent, this competition is inevitable even if the proposal is rejected, as new stores are built elsewhere in the region. The shopping center would attract many out-of-town shoppers to Drum Hill, inducing sales at nearby stores.

d. Commercial development seems much more likely than industrial development on the site (although both are very uncertain). Expected economic benefits are therefore much greater under commercial zoning.

e. If the site isn't rezoned, commercial development will occur some way, somewhere in the region. There might be an equally large center in another community (perhaps Tyngsborough or Lowell or further away) or many more small stores throughout the region. Either way, total retail sales will be about the same but the shopping opportunities and new jobs may be less accessible to Chelmsford residents.

f. Will rezoning preclude industrial development in the town or region? Without a specific proposal, nobody can say. It seems unlikely, however, since even within Chelmsford there are several other available sites large enough to serve industrial demand for many years at recent growth rates.

g. The greater number of potential jobs and the greater chance of development provide a strong argument for commercial rezoning. Economic impacts of rezoning should be considered together with fiscal impacts (also clearly positive) and traffic impacts (clearly negative).

Table 5A-1
ESTIMATED PERMANENT JOBS

	Current Zoning	Proposed Zoning
1. Possible type of development	Industrial park	Regional shop-center
2. Possible number of permanent jobs ^a	1,000	2,200
3. Probability of full development within 5 years	15%	50%
4. "Expected" number of jobs on site (line 2 x line 3)	150	1,100

^aTable 5A-3

Economic impacts were evaluated as follows.

EMPLOYMENT

a. Construction Jobs. The shopping center is a much larger undertaking than industrial development on the site; it would provide many more construction jobs (Table 5A-2). In peak years, the center would substantially increase construction employment in Chelmsford. Both projects are so large that outside contractors are likely to bring their own foremen and possibly craftsmen, perhaps hiring only laborers locally.

b. Number of Permanent Jobs. Table 5A-3 shows how permanent jobs were estimated. At this point, we can't predict whether (and how many) indirect jobs would be created off-site.

c. Increase in Job Opportunities. Both developments might substantially increase Chelmsford employment (Table 5A-3). Aside from creating more jobs, the shopping center might also hire a greater percentage of Chelmsford residents, since people characteristically commute relatively short distances to sales jobs.

d. Job Characteristics. Tables 5A-4 and 5A-5 show the type of jobs that may be created. Compared to manufacturing, shopping center jobs pay less, are more likely to be seasonal or part-time, and are more likely to be held by women (Table 5A-4). In absolute terms, however, the center is so large that it would have a greater total payroll, more male employees, and more year-round positions than an industrial park.

The center's clerical and sales jobs match the skills of many Chelmsford residents (Table 5A-5). The center would also provide a substantial number of craftsmen and operative positions, which may be important for currently unemployed community residents.

Table 5A-2

CONSTRUCTION JOBS: MAN-YEARS LABOR ON-SITE

	Current Zoning	Proposed Zoning
Gross floor area, if site developed	550,000 s.f.	1,260,000 s.f.
x Est. construction cost per s.f. ^a	\$20	\$20
= Total construction cost ^b	\$11 million	\$25.2 million
x Man-years per \$ million ^a	30	30
= Total man-years on-site labor	330	760
EFFECTS DURING PEAK YEAR:		
# Man-years	70 ^c	270 ^d
% increase in Chelmsford construction employment ^{e,f}	15%	58%
% increase in Lowell SMSA construction employment ^{e,g}	3%	10%

^afrom "Economic Impacts".

^balternate way of estimating:

if assessments are about 70% of market value, industrial park might cost \$6.3 million (requiring 190 man-years); shopping center might cost \$21.6 million (requiring 650 man-years).

^cassumes only 1/5 of industrial park is built in any one year, i.e., about 12 or 13 acres are developed in a year; recently, industrial growth in all of Chelmsford has averaged about 15 acres per year.

^dduring construction of initial stage (about 900,000 s.f.) which may itself take about 2 years (General Growth Properties, "Importance of the Mall to the Community", 1975).

^epeak man-years on the site compared to 1974 annual average construction employment. Assumes all jobs are new to area. On the other hand, man-years provide a conservative estimate of increase in annual employment.

^fbased on Massachusetts Division of Employment Security, "Massachusetts Cities and Towns, Employment and Wages in Establishments Subject to the Mass. Employment Security Law", 1974 supplement.

^gbased on Mass. D.E.S., "Employment and Wages in Massachusetts and the Standard Metropolitan Statistical Areas", 1970-1974.

Table 5A-3
PERMANENT JOBS IF SITE DEVELOPED

	Current Zoning	Proposed Zoning
Gross floor area	550,000 s.f.	1,120,000 s.f. ^a
÷ s.f. per employee ^b	550 s.f. ^c	500 s.f.
= Est. # of employees ^d	1,000	2,200 ^e
% increase in annual average employment in same category ^f :		
Chelmsford ^g	100% (manufact)	111% (trade)
Lowell SMSA ^g	5%	17%
% increase in total annual average employment ^f :		
Chelmsford ^g	21%	45%
Lowell SMSA ^g	2%	4%

^aGross leasable area (1,261,000 s.f. floor area minus 141,000 s.f. for malls, courts, etc.)

^b"Economic Impacts", Table 5-2.

^cVaries widely by type of manufacturing.

^dNearest hundred.

^eDeveloper estimates 2,400 ("Importance of the Mall to the Community")

^fCovered employment; assumes all jobs are new to area.

^gSee sources, Table 5A-2.

Table 5A-4
POSSIBLE JOB CHARACTERISTICS

	Current Zoning ^a	Proposed Zoning
Wages		
Average ^b	\$ 10,200	\$ 5,500 ^c
Total	10,200,000	12,100,000
Male Employees		
% of total ^d	67	35 ^e
#	670	770
Employees Working Full Year		
% of total ^d	70	51 ^f
#	700	1,120

^aFor manufacturing, in general; may vary considerably by type of manufacturing.

^bD.E.S., State Summary, 1974.

^cHerr Associates estimate; D.E.S. indicates \$5,400 for general merchandising (dept. stores), \$5,600 for apparel.

^dU.S. Census 1970, "Detailed Characteristics"

^eHerr Associates estimate; Census indicates 31% for general merchandising, 45% for all retail trade.

^fFor all retail trade.

Table 5A-5
OCCUPATIONS

	Professionals, Managers	Clerical, Sales	Craftsmen, Operatives	Other	TOTAL
JOBS IN DEVELOPMENT					
Current Zoning # % ^a	180 18%	160 16%	590 59%	70 7%	1,000 100%
Proposed Zoning # % ^a	350 16%	900 41%	350 16%	600 27%	2,200 100%
CHELMSFORD RESIDENTS, 1970b					
All employed # %	4,693 41%	3,045 26%	2,603 20%	1,213 13%	11,554 100%
Previous Job of Unemployed # %	59 17%	74 21%	143 41%	70 21%	346 100%

^a"Economic Impacts", Table 5-4 (based on 1970 U.S. Census).
^bU.S. Census, 1970, Social and Economic Characteristics.

BUSINESS OPPORTUNITIES

a. Competition. To what extent will the shopping center compete with existing stores in Chelmsford? This depends on where the center's potential customers now shop.

Chelmsford's population comprises about 15% of the total in the market area the developer's analysts have estimated for the center. Because of proximity and relative affluence, the share of sales to Chelmsford residents will doubtless be high, but not likely more than 25% of total sales. The other 75% plus will be sales to non-residents.

The center is more directly competitive with downtown Lowell and the Burlington Mall than with the convenience goods stores which comprise the bulk of Chelmsford retailing. Accordingly, we judge that more than half of sales in the center to Chelmsford residents will be sales which, but for the center being here, would have occurred out of town anyhow. Similarly, the bulk of sales to non-residents will be sales shifted to Chelmsford from out of town locations, rather than from local outlets. On this basis, we estimate that about 20% of the center's sales might be shifted from elsewhere in the town.

Purchasers	% of sales shifted from		Total
	Out-of-town stores	Chelmsford stores	
Chelmsford residents	15	10	25
Other customers	65	10	75
<u>TOTAL</u>	<u>80</u>	<u>20</u>	<u>100</u>

Table 5A-6 indicates the volume of sales that may be captured from Chelmsford stores. Conclusions:

(1) Although competition is mainly with out-of-town stores, the center is likely to capture 1/7 of the sales in existing Chelmsford stores.

(2) Competition is likely to be most serious for existing clothing, variety, discount and furniture stores. The developer estimates the center will capture 30% of the region's spending on such items, only 5-10% of spending on food or drugs.

(3) The developer assumes substantial population and income growth in the region. Such growth might support major retail development without creating vacancies. Substantial growth is far from certain, however; without it, the center will probably create at least some vacancies, somewhere, for some period of time.

(4) Rejecting the proposal may mean that the center gets built elsewhere in the region. At another location, the center might still compete with Chelmsford stores, although perhaps not as directly.

Table 5A-6

EFFECT OF SHOPPING CENTER ON CHELMSFORD STORES

Gross leasable area		1,120,000 s.f. ^a
x Est. annual sales per sq. ft.	\$	70 ^b
= Total annual sales	\$	78 million
x Est. share of sales captured from Chelmsford stores		20%
= Sales captured from Chelmsford stores	\$	16 million
+ Current total sales in Chelmsford stores	\$	115 million ^c
= % of current Chelmsford sales which shift to the center		14%

^aTable 5A-2^b1975 prices; developer assumes \$70/sq. ft. as initial average operating volume for the department stores.^c1972 U.S. Census of Retail Trade, adjusted for 1975 prices

Source: Herr Associates estimates

b. Existing Commercial Areas. The shopping center may thus reduce sales in Chelmsford center and other parts of town. It will, however, attract tens of thousands of shoppers from other communities to the Drum Hill area. Some of them will also shop at other stores in and around Drum Hill*. Sales at these stores may increase considerably, even if they only attract a small fraction of shopping center patrons. These induced shoppers would have to spend one dollar in those neighboring stores for every four dollars they spend in the center to fully offset the effect of sales shifted from one Chelmsford location to another. That seems unlikely given present stores, but with new development it could occur.

c. Local Suppliers. A shopping center or an industrial park might purchase supplies from local firms but there is no reason to think that this effect would be especially large.

d. Space for Entrepreneurs. The shopping center might well accommodate local entrepreneurs, especially in the mall area between the department stores. We don't know of any specific arrangements to rent to Chelmsford businessmen, however. Conceivably an industrial park might also provide space for local firms, although this may be less likely.

OTHER IMPACTS

New industrial development could add to the economic base of the Lowell region, bringing in outside income. It might diversify the regional economy and induce population growth, some of which might occur in Chelmsford. There is no way to estimate such effects in advance of a specific development proposal.

A shopping center will draw on existing income and job-seekers, probably not bringing in much income or new residents to the region. The center might also affect property values in the immediate neighborhood. Nearby commercial properties might increase in value (all those new potential customers). Residential properties, especially along North Road, might decrease in value due to the added traffic volumes.

*Although the mall may be beyond walking distance from stores on Drum Hill Road, so that shoppers would have to drive from one store location to another.

CHAPTER 6

SOCIAL IMPACTS

Social impacts of development decisions are often very important to community residents but are not often explicitly dealt with in impact analyses. New development can affect community character by changing the type and number of residents, the adequacy of their housing, the style and structure of local government, community amenities, the visual qualities of the community, and the perceived image of the community.

These issues are often ignored in impact studies because they are hard to quantify, touch on strong political and emotional feelings, raise sensitive legal issues, are clouded by misconceptions, and may not by themselves provide sufficient grounds for public decision. Despite these difficulties, it is still valuable to consider social impacts since:

- Social impacts may be residents' major concerns about proposed development, although official debate centers on, say, fiscal or traffic impacts;

- Failure to bring these concerns out in the open makes it harder to resolve conflicts;

- Analysis can suggest ways in which the proposal could be changed so that its social impacts would be more beneficial;

- Discussion can help prepare the community for impending change, easing the transition if a major development is built.

It is therefore useful to provide a structured opportunity for bringing social concerns into public discussion, evaluating those concerns as objectively as possible, suggesting which hopes or fears may be reasonable and which may be unwarranted, and determining appropriate actions by the community and the developer. A relatively simple approach is often best, involving:

1. early citizen input to identify the most critical concerns (see pages 7, 11);

2. reference to community needs and resources which have already been identified and detailed by a Master Plan; by response to the State Growth Policy Questionnaire; by specific local agencies such as a Town Government Study Committee, Historic District Commission, Housing Authority; by the regional planning agency and State Department of Community Affairs; and by other organizations such as a housing action group or civic association;

3. thinking through the likely ramifications of the proposal;
4. in some cases, review of similar developments which have been built in the community or region;
5. in a limited number of cases, conducting surveys, although these are often costly, time-consuming, and can easily produce distorted results*.

Following are some important considerations in evaluating social impacts.

Value Judgments. Many social impacts may be either good or bad, depending on one's point of view. A more diverse population, for example, may be valued by some, feared by others. Analysis should try to make clear the extent of change due to a new development (often less change than supporters or opponents had assumed). Evaluation of that change should be left to citizens and officials.

Area Affected. Consider impacts on both the entire community (e.g., housing supply, form of government) and the immediate neighborhood. Proposals can dramatically affect neighborhood character, but have little effect on the rest of the community. New development often has the greatest impact on current residents who live within earshot or view, live on streets providing access to the development, or will use the same shops, parks, or schools as occupants of the new development.

Will Change Happen Anyway? Many communities don't want to change. Major development proposals highlight change and are often blamed for all the effects of growth on a community. Some growth and change may be inevitable, however, whether or not the development in question is approved. In retrospect, for example, few individual residential developments have by themselves increased community population above what it would otherwise have been, since population is usually determined by more basic social and economic forces. Therefore:

1. Consider likely changes in the community's social character if the proposal is rejected (through new development on and off the site, turnover of residents in existing units, etc.);

*Some investigators place considerable emphasis on surveys of citizen attitudes and perceptions. For example, people living near apartments have been surveyed to determine social interactions, feelings toward new residents, and changes in their activity patterns. See New Jersey County and Municipal Government Study Commission, Housing & Suburbs: Fiscal and Social Impact of Multi-Family Development, October, 1974; Philip Schaenman and Thomas Muller, Measuring Impacts of Land Development, Urban Institute, 1974; and "Report of the Apartment Impact Study Committee" for the Burlington, MA, Planning Board, March 15, 1973.

2. Determine what difference the proposal would make; compare the proposal to what the community might otherwise be like (say) 10 years from now, not what the community is like today.

Frequently, attention should focus not on growth per se, but on the particular location, design and timing of that growth.

Assimilation. Will it be easy to assimilate new development into the community? This is often the fundamental question. The answer greatly depends on the proposed development's:

1. scale, compared to existing development nearby; small projects are less disruptive visually and socially;

2. phasing; slower growth is less disruptive;

3. balance; a project with both single-family homes and apartments produces less dramatic change on a single-family neighborhood than an all-apartment project would;

4. separation from the community; sometimes buffers are used to separate a project from its neighbors, but often people are more concerned that two separate communities might be created. Social segregation between the proposal and neighbors can be reduced by: (a) building the development in small components (e.g., extending, not interrupting, the existing street pattern); (b) marketing the development so that it will include some old community residents (not only newcomers); (c) providing facilities (e.g., playgrounds) which will be used jointly by project residents and the general public.

We have outlined six potential social impacts: population, housing, local government, amenities, visual quality, and community image. Other social impacts are not dealt with in this chapter because they are discussed in other chapters (e.g., social consequences of traffic and jobs) or are very hard to evaluate (e.g., effects on sociability, privacy, security, crime*).

1. POPULATION

Development affects the number and type of people who live, work, shop in or visit the community. New dwellings have the greatest impact and are discussed below. Population impacts may also be important in other situations, however. Some proposals would displace existing residents from the site (perhaps forcing them to move out of the community). Major factories and other new employers may increase local housing demand, indirectly increasing population. College dormitories, hospitals, nursing homes and

*For discussion of such issues, see Schaenman and Muller, Measuring Impacts of Land Development. Be skeptical of easy conclusions on these impacts; people often have strong prejudices.

other live-in institutions have many of the same population characteristics as residences. Hotels, guest houses and campgrounds also increase population, at least temporarily*. Finally, some non-residential facilities can result in tremendous but sporadic influxes of population. For example, sports and exhibition arenas, entertainment centers, and recreation facilities can attract large numbers of people for short periods of time, placing tremendous burdens on an area's services and facilities, and on the tranquility of its inhabitants.

Several factors should be considered in evaluating population impacts of new residences.

1.1 Number of Residents

Estimate for a Specific Development. The population which a development will initially contain is easily approximated:

Number of single-family dwellings x 4.0 = single-family residents

Number of seasonally-occupied single-family dwellings x 5.0 =
seasonal residents

Number of multi-family units x 2.5 = multi-family residents

Number of units reserved for the elderly x 1.5 = residents of
housing for elderly.

Table 6-1 provides some additional refinements**.

To get a sense of scale, compare proposal population with the community's total population increase during the last decade (e.g., 1975 state census minus 1965 state census; or 1970 U.S. census minus 1960 U.S. census; never mix U.S. and state census figures since they define residence in different ways).

*Some communities recognize these similarities in their regulations. The following is from the Greenfield, Mass., zoning bylaw:

"Each two guest units in a motel or hotel, four beds in a hospital, nursing home, or convalescent home, or accommodations for four persons in a boarding or guest house or dormitory or other group living arrangement shall be considered equivalent to a dwelling unit in calculating required lot area."

**Alternatively one can use data on size of household from the 1970 U.S. Census, General Population Characteristics. Increase the persons per household reported there for the community by 1 person per unit for single-family dwellings, since new homes usually have more people than average.

Table 6-1
PERSONS PER NEW UNIT

Type of Unit	No. of Bedrooms	Rutgers Study	Common Range ^a
High-rise apartment	average	2.0	1.2-2.5
	0 (studio)	1.2	
	1	1.8	
	2	2.5	
Garden apartment	average	2.2	1.8-3.0
	1	1.9	
	2	2.8	
Townhouse	average	3.1	2.7-4.0
	2	2.7	
	3	3.4	
	4	3.7	
Single-family home	average	3.5	3.2-4.5
	3	3.3	
	4	3.7	
Seasonal dwelling			4.1-6.1 ^b
Hotel, motel room			2
Campsite			4

^aMay be lower for retirement dwellings, higher for subsidized units.

^bWithin range, high for Cape, Islands, and Berkshires, low elsewhere.

Sources: Sternlieb and Burchell, "The Numbers Game: Forecasting Household Size", Urban Land, January, 1974 (Rutgers Study); Herr Associates estimates.

The hard but important question is whether proposal population represents a net increase over what would otherwise occur in the community. Is there some reason to believe that this proposal can, by itself, substantially alter the community's future population? Will the project serve a hitherto untapped market through unique design or marketing strategy? Does this development have some special advantage others have lacked, such as better financing, an extraordinary site, or a special regulatory exemption? Unless some answers are "yes", it is unlikely that the proposal would substantially increase the community's future population above what it would otherwise be (as a result of development on other sites).

One can also estimate proposal population over time. The number of people in each single-family home usually decreases over time (children grow up and move away)*. Apartments do not lose population, perhaps even increase slightly over time. Seasonally-occupied units may be converted to year-round use (a rule of thumb is that about 10% of such units are converted each year).

Estimate for Rezoning An Area. Population consequences of rezoning are estimated differently.

1. Calculate the theoretical saturation population in the area to be rezoned for both present and proposed zoning: total available land in the area to be rezoned (excluding developed and undevelopable land) minus 15% for streets and waste, divided by the required lot area per dwelling unit equals the saturation number of dwelling units; multiplying that by population per dwelling unit gives saturation population.

$$\frac{.85 \times (\text{Available developable land})}{\text{Lot area per dwelling unit}} \times \text{persons per dwelling unit} =$$

saturation population

2. Estimate the probability of development actually occurring by whatever time horizon you choose. For example, current zoning may require 10,000 square foot lots, and the land is under pressure for development, giving something like a 90% probability of development within ten years. Rezoning to 40,000 square foot lots might reduce the probability of development within that time period precipitately, say to 50% (though it might not).

3. Multiply the saturation population by the probability of development for both present and proposed zoning to get the expected populations at the time horizon.

To illustrate, suppose 1,000 buildable acres are proposed for rezoning from 10,000 sq. ft. single-family lots to 20,000 sq. ft. lots.

*In 1970 in the Boston Metropolitan Area (excluding Boston itself) single-family dwellings less than 10 years old averaged 4.1 persons per unit, those more than 10 years old averaged 3.0 persons per unit.

$$\frac{0.85 \times (1,000 \text{ acres} \times 43,560 \text{ sq.ft. per acre})}{10,000 \text{ sq. ft. per dwelling unit}} \times 4.0 \text{ persons per dwelling unit} =$$

14,800 persons at saturation under present zoning

$$\frac{0.85 (1,000 \text{ acres} \times 43,560 \text{ sq. ft. per acre})}{20,000 \text{ sq. ft. per dwelling unit}} \times 4.0 \text{ persons per dwelling unit} =$$

7,400 persons at saturation under proposed zoning.

Probability of development within ten years under current zoning judged to be 0.8.

$$0.8 \times 14,800 = 12,000 \text{ "expected" ten year population, current zoning}$$

Probability of development within ten years under proposed zoning judged to be 0.5.

$$0.5 \times 7,400 = 4,000 \text{ "expected" ten year population, proposed zoning.}$$

$$\text{Impact} = 12,000 - 4,000 = 8,000 \text{ persons reduction}$$

1.2 Growth Rate

Often the rate of population growth has a greater impact on the community than has the absolute amount of change. There is a tremendous difference in impact if several hundred new residences are built and occupied in a one or two year period than if the same number of units are developed over a decade. If, as is too often the case, the community is unprepared, sudden change may create severe disruptions in normal activity patterns, place severe strains on facilities and services, and make the processes of adjustment much more difficult. Generally, as the rate of growth increases the pace of change of all types will increase.

Growth rate for residential projects can be analyzed as follows.

a. Get an estimate from the developer of the anticipated rate of occupancy of lots or units.

b. Test that against "reasonable" expectations. Considerations might include the following:

- Is there or can there be a limit on occupancy rate imposed under zoning? If so, that establishes an upper limit of expectation.

- Is the anticipated number of units per year large in relation to the average town-wide total number of dwelling units authorized on building permits in recent years (data available from the Building Inspector, annual reports, or the Office of Code Development, Massachusetts DCA). If it is, is there some reason to believe that this proposal will, by itself, alter the town's rate of growth (see page 142).

- Is the anticipated number of units per year small in relation to the total number approved? Again, a warning flag should be raised, since most developers will try to move their entire development as rapidly as the market allows. Is the anticipated development rate as high as the market or regulation will allow? If not, then the anticipation isn't credible.

Some Massachusetts communities are now regulating growth rate by requiring that certain projects be phased over a period of several years. This can help ease community change due to the proposal. The following is an excerpt from the Greenfield Zoning Bylaw.

"Residential Development Rate Regulation

Applicability. In granting Special Permits for multi-family dwellings, for an Open Space Community under Sec. 6.13, and for mobile home parks, the Board of Appeals shall establish development phasing schedules regulating the annual rate at which dwelling units within such developments may be authorized by building or occupancy permits.

Considerations. In establishing a development phasing schedule, the Board of Appeals shall consider and address in writing the following:

- (1) The responsibility of the town to provide for at least its historic share of regional residential development, and to provide for the housing needs of all population groups.
- (2) The ability of the town to adequately service the proposed development with schools, streets, protective services, and utilities, including consideration of items listed in the most recently published Capital Improvements Program.
- (3) Commitments already made in development phasing authorizations, and the demonstrated ability of the regional housing market to absorb additional units.
- (4) The developer's requested phasing...."

1.3 Population Origin

Where will new residents come from? If most of the residents of new housing now live in the community or in its vicinity, the degree of social change is likely to be much less than if residents are strangers to the area. To estimate place of origin:

a. Ask the developer. For projects of any size, he should have made analyses of expectations, and they're probably as good a projection as can be made.

b. Compare the housing being offered to local housing needs. Any of the following probably indicate the likelihood of many newcomers:

- A large number of units per year in relation to previous town-wide rates of development;
- Units with costs higher or lower than the norm in the community;
- Multi-family units in a predominantly single-family community.

1.4 Population Composition

Who will the development serve? This is often the most sensitive but least openly discussed issue in the whole range of possible development impacts. The questions "who will live here?" and "will they be like us?" are often on many minds but rarely get asked in public. This subject is fraught with misconceptions. A New Jersey study comparing prevailing community attitudes about apartment dwellers (e.g., their income, education, employment, and political leanings) found that the preconceived notions differed dramatically from the actual characteristics*. A survey in Burlington revealed that people in single-family neighborhoods abutting apartment developments typically had a more favorable attitude toward apartments and their inhabitants than did community residents generally.

The overriding issue is the homogeneity or heterogeneity of the community. On the one hand, people are characteristically more comfortable with people like themselves, and the tendency for like groupings produces more uniform and secure physical and social environments. On the other hand, increased diversity offers the possibility of a broader range of services, opportunities, and experiences.

Key factors in considering population composition may include race/ethnicity, income, occupation, age, tenure and stability of new residents. Take as an example a garden apartment development. The service demands, activity patterns, and lifestyles of the residents will be far different if the tenants are primarily elderly than if they are college students. Another important consideration is the number of children in the development**. This has important social, as well as fiscal, consequences. It is often through their children that adults meet and get to know one another. Children also mean more activity and less quiet in the neighborhood.

*State of New Jersey County & Municipal Government Study Commission, Housing and Suburbs: Fiscal and Social Impact of Multi-Family Development, 1974.

**See page 71 for estimating the number of children in a new development.

Single-family homes usually have larger households and more children than multi-family units. However, these differences may be diminishing* as the increasing price of single-family homes places them beyond the reach of many households.

Table 6-2 compares household characteristics for relatively new and older units in the Boston region outside of Boston in 1970. Such differences in occupants between new and old units can still generally be expected, although the actual numbers have of course changed, and although there are many local exceptions to the general pattern.

In general, occupants of new housing tend to be better educated, wealthier, and live in more expensive units than occupants of older housing. The occupants of new single-family homes tend to be younger than occupants of older homes, and dominantly in their middle years. Occupants of new multi-family units tend to be either young or old, not in-between, and relatively little different in age from occupants of older multi-family units. Used with judgment, these comparisons can help in estimating likely differences between occupants of proposed units and the rest of the community population.

Compare likely population characteristics of the proposed development with recent trends. Information on the community's current population characteristics may be obtained from local and regional planning studies, housing interest groups, and area realtors.

For a new development, one can estimate characteristics of future residents based on (a) surveys of similar recent developments, (b) rough guides, such as Table 6-2, (c) the developer's marketing plans, (d) the proposed price or rent levels, from which one can infer income of the occupants. For single-family homes, annual family income is often about 40% of the selling price. Family income may be about 4 times the annual rent in subsidized apartments, 5 to 8 times the rent in medium-priced units, and 10 times the rent in luxury units.

2. HOUSING IMPACTS

In considering housing impacts, two basic questions should be addressed. First, how will the proposal affect the range of housing choice in the community? Second, what will be the implications for critical housing needs of people who presently lack adequate housing? Community housing information is usually well-documented. Sources of information include local and regional planning studies, the 1970 U.S. Census of Housing, local housing authorities, local realtors, and housing interest groups. Any community which has ap-

*New Jersey, Housing and Suburbs.

Table 6-2
POPULATION CHARACTERISTICS, NEW AND OLD DWELLINGS
(BOSTON SMSA BUT NOT IN BOSTON CITY, 1970)

	New Units ^a	Old Units ^b
Persons per owner-occupied unit	4.1	3.0
Persons per renter-occupied unit	1.8	2.3
Households with children under 18	52%	42%
Years of school completed		
Owner-occupied	13.4	12.7
Renter-occupied	12.8	12.4
Income		
Owner-occupied	\$15,000	\$12,400
Renter-occupied	\$ 8,700	\$ 7,500
House value	\$31,600	\$24,500
Gross rent	\$ 178	\$ 136
Age of household head, all units		
Under 25	5%	5%
25-29	14	9
30-34	14	9
35-44	31	21
45-64	30	42
65+	6	14
Age of household head, owner-occupied		
Under 25	1%	1%
25-29	9	5
30-34	15	8
35-44	39	23
45-64	33	47
65+	3	16
Age of household head, renter-occupied		
Under 25	16%	15%
25-29	28	19
30-34	11	10
35-44	10	16
45-64	22	30
65+	13	1

^aUnits added by construction during the sixties

^bUnits existing in 1960

Source: computed from Table 2, 1970 Census of Housing, Components of Inventory Change, Boston SMSA, Final Report HC(4)-3

plied for a Community Development Block Grant (from HUD) should have prepared a Housing Assistance Plan including a variety of information useful in thinking about local housing issues.

2.1 Housing Supply

Development can affect housing choice in a number of ways. Does the proposal:

a. broaden the mix of housing in the community (e.g., single-family and multi-family, year-round and seasonal, owner and renter-occupied)? The 1970 U.S. Census of Housing has information on existing housing by community.

b. broaden the price range of housing in the community? Note, however, that units priced beyond the means of current residents will serve outsiders.

c. involve demolition of housing on the site?

d. lead to demolition of housing nearby? A shopping center, for example, may induce conversion of nearby residential properties to commercial use.

e. increase demand for existing housing, so that current residents are displaced by higher-income people? This is sometimes an indirect effect of major employers, universities, luxury housing, and recreational facilities.

It is also useful to ask if the proposal is similar, in price and amenities, to other housing in the community or nearby communities. If similar housing has a high vacancy rate, the proposal (1) probably isn't very important for local housing choice, and (2) may reduce the value of existing housing through over-building.

2.2 Housing Need

How will the proposal affect current residents who live in substandard housing or pay a disproportionate share of their income for rent?* New development can affect housing needs in several ways:

a. by displacing low and moderate-income families (especially large families) and elderly residents, who may have few alternatives in the local housing market unless adequate relocation is provided;

b. by providing low-cost housing for low and moderate-income people. With rising housing costs, new low-cost housing may only

*D.C.A. has estimated the number of people in substandard housing and those paying more than 25% of their income for rent in each community. See Table 7 of the D.C.A. Housing Needs Study. Compare their estimate with other local housing data.

mean mobile homes or subsidized units*. Information concerning (1) whether or not any units will be subsidized, (2) how the anticipated prices/rents compare to what people living in the community can afford, and (3) the number of bedrooms (i.e., can large families be accommodated) will be helpful in determining whether a development will help meet the needs of low and moderate income people.

c. by affecting the community's status under the Ch. 774 "anti-snob zoning" program. New subsidized development may exempt the community from state override of local regulations**. Projects approved by the community may thus prevent less sensitive development over which the community would not have a final say.

3. LOCAL GOVERNMENT

As communities grow, so too do their governments. Local government growth often means changes in structure, style of operations, range of governmental services, and costs***. Only rarely will a single development force a change in the structure of local government. The cumulative effects of several developments may be significant, however. Increased population may eventually lead to:

a. a shift from open to representative town meeting. Communities over 15,000 population are likely to have representative government (Table 6-3). Note, however, that local preferences can delay that change: three towns over 30,000 population still have open town meetings.

b. a shift from part-time lay administrators to full-time professionals (executive assistants, town and city managers). The majority of communities over 20,000 population have professional administrators (Table 6-3).

c. increased bureaucracy. As government organizations grow they become more formal and compartmentalized. Citizens have less access to officials. It becomes harder for people to sit down together and work out problems informally on a first name basis.

d. public provision of services which could not have been supported in a smaller community, such as public sewerage, solid waste collection, major libraries, swimming pools, tennis courts, skating rinks.

*Subsidized housing may include public housing constructed by a local housing authority with subsidies from D.C.A., a mixed-income development under the Massachusetts Housing Finance Agency, or subsidized rents in some or all units of an apartment complex (through federal "Section 8" assistance).

**Provisions are complex (sections 21-23, Ch. 40B, Mass. Gen. Laws), but the State Housing Appeals Board can generally overturn a local rejection of subsidized housing if less than 10% of the community's existing housing supply is subsidized.

***See "Fiscal Impacts", p. 86.

Table 6-3
GOVERNMENT STRUCTURE, 1975

Population, 1975	Number of Municipalities	% of municipalities with: Open TMA ^a Rep TMA ^a Council ^b		% of municipalities with: Manager or Exec. Assist.
0- 5,000	141	100	0	6
5-10,000	63	95	3	22
10-15,000	44	89	11	32
15-20,000	29	55	31	45
20-25,000	15	33	60	73
25-30,000	15	13	67	73
30-35,000	11	18	37	55
35-40,000	8	12	25	25
40-60,000	12	0	25	17

^aTMA = Town Meeting

^bCouncil = City or Town Council

Sources: Massachusetts 1975 State Census; Massachusetts League of Cities and Towns,
Municipal Directory, 1975-1976.

e. transfer of political power from "oldtimers" to "new-comers". New residents are often very politically active and involved in local government*. New residents may have different values and different preferences for local spending.

4. AMENITIES

New development can affect community amenities in a number of ways. Look for the following.

On-Site Services and Facilities for the General Public. A shopping center may greatly increase the variety of stores easily accessible to local residents. Proposals involving entertainment, recreation, restaurants, professional services, specialty shops, hospitals can make a community a more convenient and rewarding place to live.

Some residential developments also provide amenities for the general public, such as golf courses, ski facilities, meeting halls, trails, and preserved open space. Density bonuses can be granted to reward and encourage such amenities**.

Indirect Demand for Facilities, Services, and Organizations. As a community grows it becomes able to support a much wider variety of activities. New development (residences, universities, etc.) may increase local population enough to support specialized shops, services, religious, social and fraternal organizations.

Effect on Existing Amenities. Proposed development may be located in the vicinity of (or atop) cherished community assets: woods, wetlands, meadows, cliffs, historic buildings and areas***. These amenities may be an important element in the character of the community. Loss or damage to such amenities can be an important cost of new development. Note, however, that such areas might be threatened by development even if the proposal in question is turned down.

Sensitive design is often the key for dealing with such areas. Cluster development, for example, may allow natural features to be preserved for open space. The alternative may be a large-lot subdivision covering the entire site and destroying all its natural features.

*New Jersey, Housing and Suburbs.

**See the new state zoning law, Chapter 40A, Sec. 9.

***Valuable natural areas are often identified in local conservation plans. Some historic buildings, sites, and landmarks have been identified by the National Register of Historic Places, local and regional historic commissions, the Massachusetts Historical Commission, and private organizations such as the Trustees of Reservations.

5. VISUAL QUALITIES

Increasingly, courts are recognizing aesthetics as a proper area for public concern and exercise of power. Certainly, a major concern often raised by new development is its appearance. Judging it on that score is, however, not simple. We suggest two alternatives.

First, an overall visual policy might be developed, and the proposal tested against that policy. Such policies are rare. Martha's Vineyard has one which is widely recognized though not legislatively adopted*. It provides a concrete basis for examining the consistency of proposed siting, landscaping, colors, and materials.

An alternative is establishment of a professionally skilled design review panel, whether given formal powers or not. Such a panel could probably provide insight into the visual consequences of the proposal, and into how design modification could help the proposal to better serve the community.

Ad hoc lay judgment of visual impact, without pre stated criteria and without professional assistance, is of questionable value and fairness, since visual consequences are seldom obvious, and there are few universally applicable "rules", other than that things hidden from view by topography or trees aren't likely to be offensive.

6. COMMUNITY IMAGE

How will the proposal affect the perception of the community by residents and outsiders? Major new development can alter a community's image substantially, sometimes to such an extent that the development comes to symbolize the community. Examples in Massachusetts include the Patriots' Stadium in Foxboro, recent apartment complexes in Framingham, New Seabury cluster development in Mashpee, Yankee Atomic in Rowe, and the U. Mass. expansion at Amherst.

Developments which are very large, visually prominent, or very different from the nearby area can substantially alter the image of the neighborhood or community. Such changes are important in three ways. They affect how residents feel about the community. This in turn affects their future investments: how likely they are to improve and maintain their properties, how likely they are to move elsewhere. Finally, the community image influences outsiders who might come to the community to visit, to live, to establish businesses.

*Vineyard Open Land Foundation, Looking at the Vineyard, West Tisbury: V.O.L.F., 1973.

CHAPTER 6A

SOCIAL IMPACTS OF DRUM HILL REZONING

Social impacts of Drum Hill rezoning are not likely to be very critical. A regional shopping center would not bring new residents to the town (with their effects on population, housing and town government). Moreover, Drum Hill Road is already developed commercially. Following are possible social impacts, none very surprising. A regional shopping center would:

a. substantially increase the range of shops and services easily accessible to Chelmsford residents. Residents wouldn't have to drive to Burlington.

b. become a locus of community and regional activity. The center will be a public meeting place where people run into each other, hang out, eat. Such centers often attract large numbers of teen-agers and elderly who spend large amounts of free time there.* Parents, teachers, teen-agers, and shopping center managers may differ in their views of whether such a youth hang-out is good or bad.

c. affect Chelmsford's image, certainly for outsiders and possibly for residents. People will think of Chelmsford not only as a residential town but as a major commercial center. Examples: Burlington, Natick, Braintree. This may be good or bad, depending on one's point of view, and can be reinforced or diminished by the name given to the center.

d. probably have minor visual impacts on the Drum Hill area. Visual effects depend on the detailed design, of course, which hasn't been prepared, but the site is already scarred by gravel operations, the mall would be set back a considerable distance from existing roads, would be in a low area, and would be behind existing stores and parking lots.

NOTE: Impacts described in earlier chapters (increased traffic, lower taxes, more jobs) naturally affect the quality of life and social character.

Industrial development would probably have little social impact on the community, although (depending on the specific development) it might induce some workers to move into Chelmsford.

*"The Malls: Social Spots for Young, Old", Boston Globe, February 13, 1976, page 1.

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a. Municipal Reports: annual reports, Master Plans, public facility studies, etc.;

b. Regional Planning Agency studies;

c. State reports on each community: the Department of Commerce and Development is planning to issue a new set of "profiles" for each city and town, serving a function like that of the old "Monographs". The Office of State Planning is compiling a "Historical Data Package" for each city and town, with information on population, employment and land use in 1950, 1960, and 1970. Both sets of reports are due to be published in 1976.

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